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Vol. IX. No. 1. JUNE, 1902.

HAYMAKING.

Within the last ten or fifteen years the practice of haymaking has become so much modified that it is now a completely different operation, or series of operations, from that which obtained in the boyhood of men still young. The writer can remember when the scythe, rake, pitchfork and cart were absolutely the whole outfit needed for the work, while now nearly every one of these—even the pitchfork—has been practically discarded, and all the labour is now done by horse-driven implements, excepting where haymaking is carried out on a small scale.

To show wherein this advance has been made it will perhaps be best to take up each operation *seriatim*, and point out what are now considered the most approved and advanced methods, beginning with the cutting of the grass.

The mowing machine has been in use for over thirty years, but the machine of to-day is a very different article from what it was a generation ago. Without going into details it need only be pointed out that in those early days a swathe of three feet to three feet and a half wide was the usual thing, while now five and six feet are quite common, and the work is quite as well within the power of two horses as the old size was in its time—so much more easily and more perfectly are all the details of the mechanism made to work now. The chief trouble is with the land: if the surface of the field is irregular, or if there are deep furrows in it, then the short knife bar makes the best job, but where the land is fairly even the

long bar works perfectly well, while, of course, it gets over the ground much more quickly. To assist the low cutting of the grass and its removal from the knife-bar, a self-driven reel is now attached to the mower—this arrangement being a great help where the crop is tangled or leaning away from the machine.

It may be objected that a five or six foot swathe cannot be turned over so comfortably as a narrow one, and may require to be divided into two when the rakes are called into action to "make" the hay, but this leads us to the next point—the use of tedders, "kickers," swathe-turners, and other implements of this kind. The original form of tedder has been almost generally discarded, and various forms of turning machines have been brought into use in this country; while several other forms are in use in America, which have not yet been introduced here. As all these machines are adapted for turning two swathes at a time, each of about 4 or 4½ feet wide, the question naturally arises whether a 5 or 6 feet swathe is not very awkward to manage with such machines? Probably it is, but this question involves the asking of another. Is it necessary to turn hay at all, to "make" it? Paradoxical or heretical as it may seem, it is deliberately affirmed, that in nine cases out of ten more harm than good has been done to hay in turning it over. It may be perhaps necessary here to state that the writer has had a long experience in haymaking both in England and in Scotland, in all sorts of weather and with all kinds of crop: he has waded for a whole day up to the knees in water to save the hay-cocks from being swept away by the floods in Nithsdale, and has sweated under the blazing sun of Essex where there is but little rain: he makes about 300 acres of hay per annum and has handled probably 8,000 acres in his lifetime—not as a spectator, but as one taking his share of the burden and heat of the day: and he has also had the advantage of seeing how things are done in several countries abroad. And the result of all this experience is that he affirms that in the great majority of cases the hay is best left to make itself and ought not to be touched at all until it is fit to carry. The exceptional case is where there is continual wet weather,

whereby the hay is battered into the ground and the grass begins to shoot up through it again. In such a case the chance should be taken of a gleam of sunshine to turn it up to keep it in evidence lest it rot. In Scotland it would at least turn yellow underneath if not moved. In ordinary, moderately fine weather, however, the most desirable course is to leave it alone after cutting until it is partly dried and "made" on the top of the swathe, then rake it together into windrows and cock it up, when it is safe from either sun or rain. If there is much green and damp stuff in the swathes when raked up, then the windrows can be left for an hour or two before cocking up; but otherwise in the southern half of England this is all that is needed, and the writer has made thousands of tons of hay in this way. The method adopted in Scotland is necessarily different and will be touched upon later.

In connection with this point it should be noted that hay lying in the swathe, as deposited by the mowing machine, is in such a position that it shoots the water off without getting very wet. The natural glaze on the stems assists this process, and thus a shower of rain or a wet day or two does little harm. On the other hand, when the hay is turned the stems are broken, thus letting the sap out and the wet in, while the clover leaves get badly knocked off, and there is a waste of labour in addition. Where there is a very heavy crop—say over two tons per acre—it may be necessary sometimes to teaze the stuff out, but usually this necessity does not arise. The writer has a tedder which is brought out to the field at the beginning of the season in case it may be wanted, but last year it was never used, and not one acre of the whole crop was turned at all. The keynote of haymaking is cocking or "quiling." If there is continuous fine weather this may not be necessary where the carrying can keep pace with the cutting, but if the hay is likely to have to lie some time then it should be cocked to keep its colour and prevent it from becoming sunburnt. On the other hand, in broken weather if the stuff can be got to the half-dried stage, let it be put into cocks, and it is then safe from further wasting. Rain only wets the outside straws, while an occasional spell

of sunshine allows of the cocks being turned over, shaken up and *re-made*, but not shaken *out*. A properly made cock will stand a week's rain without much harm, but it must be properly made by shaking up the stuff in the first place and thatching the last layers evenly over the top.

It is remarkable what good hay can be made in bad weather by keeping the stuff in cocks, and how quickly a fieldful of cocks can be "turned" and re-made, when every man takes a row by himself, and the master sets the pace. But even with cocking, as with turning, the swathe, the benefit depends much on the subsequent weather, for it often happens that hay which was let alone will dry faster and be fit to carry when the sun and the wind come, before cocks alongside, which may be slightly clammy inside, and require to be split or turned over for an hour or so before carrying. As stated above, it is generally better to let the hay lie in the swathe untouched.

After the hay is "made," the next process is the carrying and stacking, and it is here that there has been such a tremendous evolution of labour-saving machinery within the past few years. The old way—which of course is still the most popular—is to have the hay ready in cocks or windrows, to pick it up with pitchforks and put it on to a cart or waggon, where it is piled by one or two men, roped down and then hauled to the stack. The writer has been told by some of his men that in the old days when beer was plentiful, it sometimes took two hours to load a waggon, while in one of our standard books on farming there is an illustration of a waggon being loaded up with hay, and with three horses in it—as if this were the pattern to follow.

Several methods of loading and carrying hay with machinery have been introduced—mostly from America—but the writer proposes to describe and illustrate only one, chiefly because it is the method he has himself practised for several years—it having been introduced by him—and with which he has had the most practical experience.

The principal implement is called the sweeprake, of which the annexed figure is an illustration (Fig. I.).

The hay is prepared in windrows or cocks, the horses are

walked down to the end of the row and the implement wheeled round so that a horse is placed on each side of the

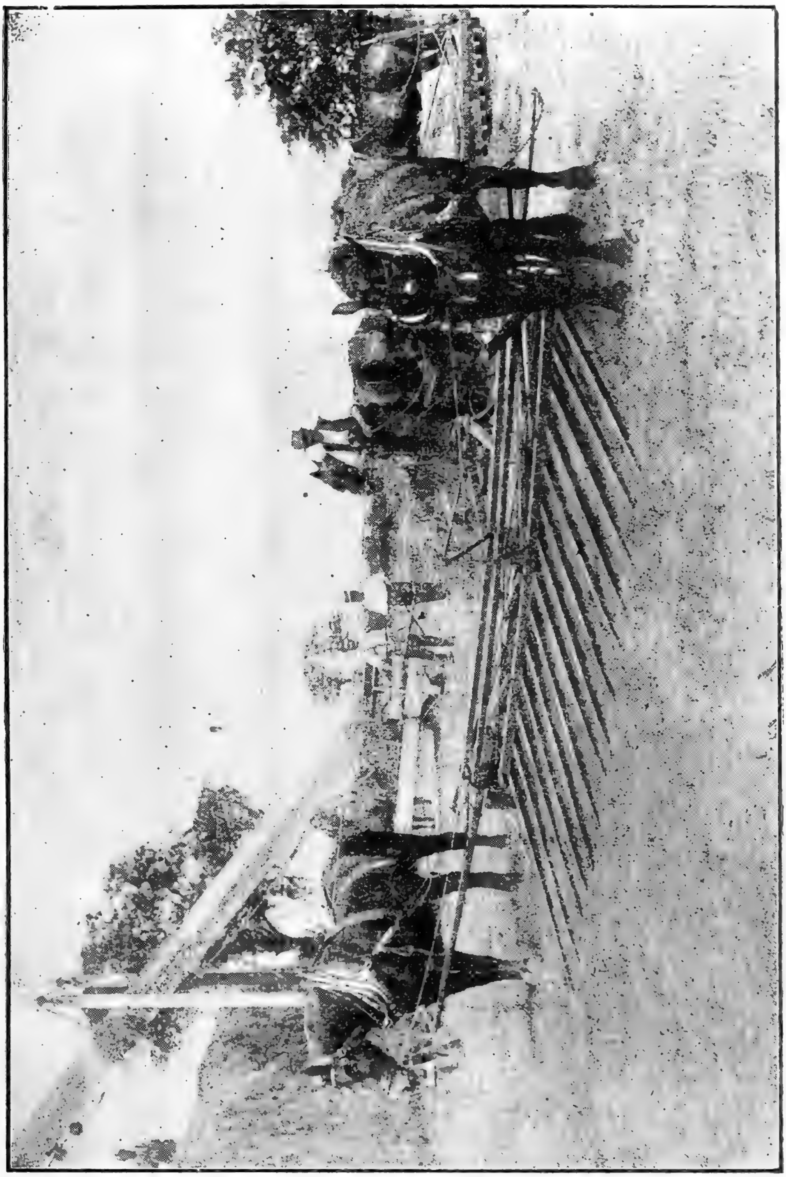


FIG. I.—THE SWEEPRAKE.

row; they then advance and the long teeth slide in below the hay and the whole is scooped up as fast as they walk. When the rake is full they are wheeled out of line and the whole is

then dragged to the stack where the load is automatically deposited by simply backing the horses.

This implement will pick up the hay out of the swathe, but it will not pick up a very large load in this way, and it is better to have it in cocks or heaps. Where it has not already been cocked it is sufficient to rake it up into windrows and then with the rake pull up the rows endwise into heaps or "lumps." An ordinary load of the sweeprake is two-thirds of a cartload, but a full cartload can often be taken when the hay is in extra good condition and it can be dragged downhill. If the hay does not pick up smoothly then it is a sure sign it is not fit to stack.

Having got the hay to the stack the next process is to get it placed on it, and the implement next shown is the complement of the other. Many devices for this purpose are in use in America, and the one the author has adopted in practice is a combination of the principle of an American stacker adapted to an English elevator. As will be seen in the engraving (Fig. II.) the long tines or teeth rest on the ground in the reverse way of the sweeprake, and when a load is brought up on the latter it is driven straight on to the elevator tines—the teeth of the sweeprake interlocking with these—and the load deposited by backing as above mentioned. By winding a handle with drum and ratchet attachment, the elevator tines are next wound up as required and the load of hay gradually tipped on to the revolving web of the elevator, and carried upwards in the ordinary way; a movable reversed sweeprake thus taking the place of the hopper on the elevator.

It will thus be seen that, in ordinary, fine weather, the hay is made, carried, and put on to the stack without ever being touched by hand tools at all, as it is only in the building of the stack that forks come into use at the end.

It may be objected that it is only in the case of large fields and with a large acreage of hay that this system can be adopted. But it can be carried out on a small scale with an ordinary elevator, or even a horse fork (though the latter is not so suitable for this purpose) and one sweeprake. And where the fields are small it is only necessary to enlarge some of the gaps which usually exist in most farm fences, to make

a gangway through from one field to another, and thus bring the produce of several fields to one centre. The only drawback to this modern system is that the hay must be stacked in the field where it is grown, as the sweeploads cannot be taken along a road to a stack-yard or a hay-shed. In the latter case some of the "loaders" used on carts with frames would be the best arrangement.

The invention of the horse-rake was one of the greatest advances made in haymaking, as those will know who can remember the time when the stuff was windrowed by hand-rakes and forks. But now the horse-rake itself is undergoing a great development—has indeed undergone it

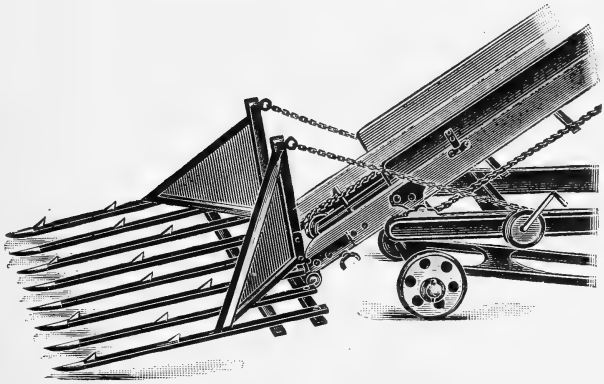


FIG. II.

already. The first machines were toys — comparatively speaking—alongside of those now made, but within the last few years they have been gradually growing in size, until now rakes of 12, 14, and 16 ft. are common. It is obvious that it is a great convenience to have the rake of a size to suit the widths of the swathes, and for this reason the standard size in the past has been about 8 ft. wide; but now that they are made to run so easily it has been found that a much greater width is quite within the power of one horse and one man to handle, and a new adjustment has had to be introduced in this respect. A still newer improvement is the introduction of the 2-horse rake of 18 to 20 feet in width, to which the horses are yoked with a pole between. One man can work this with a pair of horses and do as much work

as two men formerly did with the old single-horse rakes. Rakes of this size are taken through the gates by having the wheels adjustable on the sides, so that the whole can be packed up to go endwise, or else a light sleigh-carriage is used for moving purposes. In the case where a wide mowing machine is used it is obvious that a wide rake to take the swathes is also necessary, so that an 18 ft. one would thus take three wide or four narrow ones.

It is obvious that the system above described is not applicable to Scotland, the north of England, Ireland, or any district which has a large rainfall. The method of procedure and many of the implements are radically different, and by no possibility could the two styles be approximated. This difference is one wholly of climate or rainfall, owing to which there is not only a greater difficulty in getting sufficient sunshine to dry the hay, but the hay itself contains a greater proportion of moisture both before and after it is made. The author does not know of any comparative analytical tests having been made on this point, as regards hay or grass from say the south of England as compared with the south of Scotland. But he has found from experience that in estimating the weight of a crop of hay while growing, the bulk of grass which in Scotland would yield say a ton and a-half per acre will yield only a little over a ton in the south of England. The percentage of moisture in the grass and cured hay makes all the difference, and prevents the English method of curing from being adopted in the north.

Put briefly, the Scottish method is to put the hay up in the fields where it grew, in little stacks called ricks, pikes, or tramp-cocks, each containing a cart-load, or say 10 to 12 cwt. of hay, and to allow these to remain until sufficiently made or tempered to permit the hay to be carried and put into a stack, several weeks sometimes elapsing between the "ricking" and the "stacking" of the hay. The carrying of these ricks to the stackyard has evolved the invention of another implement to take the place of carts and the laborious work of pitchforking. This is the rick-lifter, a tipping platform on wheels provided with shafts for a horse. It is backed to a rick, tipped down, a chain passed round the

bottom of the rick, and the mass of hay pulled bodily on to the platform by winding a windlass attachment on it. When past the axle-centre the whole tips back to the horizontal with the rick upon it. It is then hauled like a loaded cart to the stackyard, where a horse-fork puts the whole on to the stack in about three or four "grabs," thus again doing away with the heavy work of hand-forking.

It would occupy too much space to go more fully into the minor details of the work, or to describe special systems which are in vogue in some districts. Enough has been said, however, to show how the use of labour-saving implements has made it possible to handle large acreages or large crops with very little trouble. There need not now be any of the heavy, straining work which was at one time the accompaniment of haymaking: the haymaker rides or drives or tends his machine without losing any sweat, and, at the same time, does three times as much work as his father did, thus enabling a farmer to rush his crop together in a very short time at a critical period.

PRIMROSE MCCONNELL, B.SC., F.G.S.

THE PURCHASE OF FEEDING STUFFS.

In making purchases of cakes and other feeding stuffs a farmer often experiences a difficulty in arriving at a conclusion as to what material to buy, or which particular brand of cake to select.

The circumstances that will determine his selection are very various, but a few of the considerations that deserve attention are indicated on the following pages. The present article, however, is strictly confined to considerations affecting the selection and purchase of foods, and does not touch upon other important matters, such as the compounding of rations, manurial residues, etc., which may be left to be dealt with later.

In order to buy feeding stuffs intelligently it is necessary that a farmer should be well acquainted with the contents of the commoner foods, and should be in a position to appreciate the value and uses of the various nutrient ingredients. Such knowledge is of service in enabling him to select the foods that are at any time in a favourable position on the market, and so to compound rations that are at once cheap and effective.

General Composition of Foods.

The accompanying arrangement illustrates the component parts of all foods, whether home-grown or purchased :—

Feeding Stuff	Water		
	Dry Matter	Nitrogenous substances	Albuminoids (Proteids)
			Amides
		Non-nitrogenous substances	Fats and Oils
			Carbohydrates
			Fibre
			Mineral matter (Ash)

Commencing from the left hand, it will be seen that feeding stuffs are primarily made up of water and dry matter, and that the latter consists of nitrogenous and non-nitrogenous

constituents, which, again, may be sub-divided—the nitrogenous into albuminoids and amides, the non-nitrogenous into carbohydrates, fats, etc.

Albuminoids.

The albuminoids or proteids are the true flesh, lean meat or muscle formers, and are sometimes termed the "essential" or "indispensable" food ingredients, because without them life could not be maintained. They contain nitrogen to the extent of about 16 per cent., which, together with part of the carbon, hydrogen, and oxygen, is utilised for the construction and repair of animal tissue; while the rest of their carbon and hydrogen, by combustion in the body, is utilised to maintain the heat of the animal and to supply energy or mechanical force. Beyond this, the albuminoids, if used in excessive quantity, may contribute to the production of fat, or, at least, may protect the fat stored up in the tissues from consumption. If albuminoids are fed in greater amount than is required to repair the waste of animal tissue, the excess is merely burned up, and has no more value than an equal amount of carbohydrates, which are, of course, much cheaper. Many farmers commit a grave error in using rations excessively rich in albuminoids.

The foods chiefly distinguished for richness in albuminoids are linseed and cotton cakes; but beans, peas, dried grains, and malt dust also contain a large amount of these substances.

Amides.

The amides, although containing nitrogen, are of comparatively little value as flesh-formers. They appear to be heat-producers, and therefore serve the same purpose in the body as the carbohydrates. In heat-producing capacity, however, the amides, weight for weight, possess only about half the value of carbohydrates. Important amounts of amides occur neither in the seeds from which cakes are made nor in corn or other mature vegetable products, so that, in the present connection, they may be left out of consideration.

Carbohydrates.

The most important are starch and sugar, after which

comes cellulose. Carbohydrates comprise the bulk of the feeding material in cereal grains, hay, straw, and roots, and in these foods they must be looked upon as the chief ingredients of value. In oil cakes, pulse grains, dried grains, and malt dust, the feeding value is derived to a large extent from albuminoids and fats. The chief function of the carbohydrates is to supply heat and energy, and when fed in large quantity they are also capable of producing animal fat.

Fat and Oil.

The fats and oils are extremely potent heat-producers, and, weight for weight, are nearly $2\frac{1}{2}$ times as valuable for this purpose as the carbohydrates. It has, in fact, been found by experiment that a pound of pure fat can produce as much heat as about $2\frac{1}{2}$ pounds of pure starch or sugar. When sufficient heat-forming food has been consumed to maintain the temperature of the body, fats and oils may be largely stored up as fat in the body of the animal consuming them, and so increase its weight. Linseed, linseed cake, and decorticated cotton cake are the foods richest in fat, after which come dried grains, undecorticated cotton cake, oats, and maize.

Fibre.

Fibre consists mainly of cellulose, and though, under certain circumstances, it may be so affected in the animal's body as to have some feeding value, its importance in this respect is not great.

Mineral Matter.

Mineral matter, although performing an indispensable function in animal nutrition, may be neglected in arranging diets for mature animals, as it is usually present in sufficient quantity in all foods. This constituent of food is of more importance in arranging diets for young, growing animals.

COMPARATIVE VALUES OF FOODS.

Manures can be valued, conveniently and reliably, by taking the number of units of the manurial element or elements that they contain, and multiplying by the market value per unit of such elements. (See *Journal*, Vol. VIII, No. 4, or Leaflet No. 72.) Although this system of valuation cannot

be employed with so much ease and certainty in the case of feeding stuffs, it is the only one that admits of the use of definite and detailed figures, and, if applied intelligently, it is capable of furnishing useful information.

In the case of manures three substances only are valued, namely, nitrogen, phosphates, and potash. Similarly, in the case of foods, the valuer has regard to but three constituents, which in this case are albuminoids, oil or fats, and carbohydrates.

In comparing the three main constituents of food, albuminoids and oil are generally credited with a value which is about $2\frac{1}{2}$ times as great as that of carbohydrates, so that, to get the number of units in a food, we multiply the percentage composition as regards albuminoids and oil by $2\frac{1}{2}$, and to the product add the percentage of carbohydrates. As a formula it may be thus expressed :—

$$2\tfrac{1}{2}\,(\text{albuminoids} + \text{oil}) + \text{carbohydrates} = \text{total food units.}$$

Suppose that a sample of linseed cake guaranteed to contain 32 per cent. albuminoids, 11 per cent. oil, and 34 per cent. carbohydrates is offered at £9 per ton, the number of units is $2\frac{1}{2}\,(32 + 11) + 34 = 141\frac{1}{2}$, and the value of a unit is therefore $\dfrac{£9}{141\frac{1}{2}} = 1s.\ 3\frac{1}{4}d.$

Assuming that another sample of similar cake is offered whose composition is guaranteed at 28 per cent. albuminoids, 9 per cent. oil, and 35 per cent. carbohydrates, the number of units in this case is $2\frac{1}{2}\,(28 + 9) + 35 = 127\frac{1}{2}$, and this, at 1s. $3\frac{1}{4}$d. per unit, comes to £8 2s. per ton.

The value of different brands of the same kind of cake, say, linseed, does not depend altogether on the chemical composition; other circumstances, such as hardness, freshness, etc., being not without material influence. And if there are difficulties in the way of depending entirely upon the system of units in determining the value of different samples of the same kind of feeding stuff, the difficulties are so great as to render the system practically inapplicable where different kinds of feeding stuffs are compared.

THE CHIEF FEEDING STUFFS.

Linseed.—The chief sources of the supply of linseed are

India, Russia, and America. Russian seed is smaller in size and darker in colour than the Indian seed. Genuine linseed weighs not less than 52lbs. per bushel.

The use of linseed—as distinguished from linseed cake—amongst farmers is chiefly restricted to the feeding of calves. It is found that linseed meal or crushed linseed added to skim or separated milk is one of the safest and most economical substitutes for the abstracted milk-fat. Linseed approaches more nearly in composition to the solids of milk than any other food, and the oil which it contains, to the extent of 34 to 38 per cent., is easily digestible. There is, however, a risk in buying any grain or seed in the form of a meal, as it is difficult to detect impurities when the material is sold in this condition. Farmers purchasing any considerable quantity of linseed meal will be well advised to have samples analysed occasionally. One of the commonest adulterants of linseed meal is ground linseed cake. The latter does not contain more than one-sixth to one-third of oil of the other, and the amount of fibre in it renders it unsuitable for giving to young calves as a substitute for milk fat. Again, the meal of almost any cereal grain can be mixed with linseed meal in fairly large proportions before the substitution is likely to be detected with the naked eye. The object of such admixture is at once apparent, for linseed cake and cereal meals cost, roughly, about £6 to £12 per ton, whereas the price of genuine linseed is frequently about £20 per ton. The risk would be obviated by purchasing whole linseed and having it ground at home, but the objection to this is the difficulty of grinding owing to the linseed clogging the grist mill.

Circumstances may arise in which it becomes desirable to use home-grown grain instead of purchasing linseed cake for the fattening of cattle or sheep. The following substances may be mixed in the proportions indicated and ground in an ordinary steel grist-mill.

8	bushels	oats.
4	,,	barley (or maize)
2	,,	peas.
1	,,	linseed.

If this mixture be given to stock with an equal weight of

ground decorticated cotton cake the whole will approximate in composition to good linseed cake.

Cakes.

There are many kinds of cattle cake, but four only are commonly used in this country:—Linseed cake, decorticated cotton cake, undecorticated cotton cake, and mixed or compound cakes.

Regarded as a group of feeding-stuffs, cakes may be considered as highly concentrated albuminoid or flesh-forming foods. For this reason, they supply the deficient feeding material where consumed with a diet of straw and roots, which are essentially carbohydrate or heat-producing foods. Where the straw is replaced by hay the concentrated food need not be so highly albuminoid in character, and, in that case, cereal grains may often be economically substituted, partially or entirely, for cake.

Next to albuminoids the most important ingredient in cake is oil, and the price of certain sorts of cake is often largely controlled by the percentage of oil present. It is well known that oil is not equally valuable from whatever source it is derived, and it is important that all the oil in a cake should be the natural product of the seed from which the cake takes its name. This is a matter to which farmers, but especially chemists, should give their attention, as there is a strong temptation to increase the percentage of oil in cake by the addition of a cheap mineral oil that may have no feeding value. Thus in a linseed cake the whole of the oil present should be linseed oil. That the fattening capabilities of a cake are to some extent due to the oil there can be no doubt, as experiments upon sheep in this country have clearly showed the superiority of cakes rich in oil over others poor in this ingredient; but farmers should be careful that the extra percentage of oil in a cake is not purchased at too high a rate.

Linseed and cotton cakes contain no starch or sugar, the carbohydrates being represented by mucilage and cellulose. The amount of these present in such cakes is of minor importance compared with the albuminoids and oil, because the

heat forming (carbohydrate) substance is supplied in large measure by the straw and other bulky material with which cakes are always fed. Mixed or compound cakes often contain starch and also some sugar, their ingredients comprising grain, maize, etc., and a certain amount of spice.

Cakes, if pure and well made, are extremely digestible as much as 80 to 90 per cent. of the nutrient material in them being often digested by cattle and sheep. The manurial residues of cakes made from oil seeds are of higher value than those of any other foods, although the residues of malt dust, dried grains, beans, and peas are not greatly inferior.

Linseed Cake.—This is the residue in the process of extracting the oil from linseed or flax-seed. The quality and character of the cake varies with the following conditions :—(1) The kind of linseed used; (2) The manner in which the seed has been screened and freed from its impurities; (3) The amount of pressure that has been employed in the extraction of the oil and the compression of the residue into cake.

Of recent years the introduction of heating processes, and, more especially, the employment of chemical agents for the purpose of extracting the oil, have resulted in placing upon the market cakes which are very hard in consistency, close in texture, and poor in oil.

In purchasing this cake, farmers should insist upon having the consignment invoiced to them as "Pure Linseed Cake," or simply as "Linseed Cake."

They should not be content with such phraseology as "95 per cent. pure," "made from 95 per cent. linseed" or "made from seed pure as imported." When a cake is invoiced as "Linseed Cake," the vendor is bound under the Fertilisers and Feeding Stuffs Act to supply a cake made from linseed alone and without admixture of other seed or substance. The term "Oil Cake" is very misleading, and may apply to a cake made from almost anything.

The chief kinds of linseed cake are English or Home Cakes, American, and Russian or Baltic. Home-made cakes are usually fairly soft, and of late years they have been much freer from impurity than formerly, especially when sold under

the designation of "Pure Linseed Cake." In regard to quality they usually contain 9 to 12 per cent. oil, and may be looked upon as intermediate in richness between American and Russian.

American cakes are usually rather hard and poor in oil but are correspondingly rich in albuminoids.

Russian cakes are darker in colour than American cakes. They are usually rich in oil, but are sometimes rather impure.

It will usually be found in the case of linseed cakes that as the percentage of oil increases that of albuminoids diminishes.

Although some other foods, or mixtures of foods, may produce as large an increase in fattening cattle, none has the same capacity for imparting "finish" and "touch." The best feeders, therefore, generally finish their cattle on a liberal allowance of linseed cake.

Rough Tests of Linseed Cake.—Three methods are open to the farmer of gaining a rough idea as to the purity and quality of a linseed cake:—

(1) By inspection with the aid of a pocket magnifying glass and a penknife he can detect the presence of substances other than linseed when these are of fair size. As a rule, however, they are so much broken up as to be difficult of identification. The smooth, shining, dark, generally more or less triangular-shaped seeds of Polygonum can often be seen. The round, dark-brown husks of rape seed are familiar. The seeds of corn cockle are dark brown and very rough on the surface. Corn spurrey is a black seed with an almost smooth surface and surrounded by a delicate disc. Pieces of straw can sometimes be detected, and sacking from the bags in which the cakes are pressed.

(2) The presence of too much sand may be suspected if the cake feels gritty when small pieces are crushed between the teeth. The flavour should be pleasing and not pungent or bitter.

(3) A jelly may be made by mixing one part by weight of the cake with six parts of boiling water. The jelly should have a mild taste and should not be bitter or rancid. If the jelly be covered up and warmed gently for some time the

presence of mustard may be detected by the smell. Cakes resulting from the chemical process of oil extraction will not always form such a jelly. They are usually very poor in oil.

Cotton Cakes.—Raw cotton seed, as it is gathered from the plant, consists of three distinct layers of material. On the outside is a dense mass of long white fibres. The character of this layer gives to raw, uncleaned cotton-seed the appearance of small pellets of cotton wool. This outer covering of cotton is removed by the process of "ginning," and when this is thoroughly done the cleaned cotton seed shows the next layer, which consists of a smooth, dark brown hull or husk. Inside this is the kernel, which, in Egyptian and American Sea Island seed, is whitish or yellow. In Indian and ordinary American seed the kernel is velvety. In the process of extracting the oil the kernels may first be removed from the hulls, or the hulls may be ground in along with the kernels. If the hulls are separated from the kernels, we get decorticated cotton cake; if the hulls have not been removed we get undecorticated, rough, or "English" cotton cake. The latter cake is usually made from Egyptian seed, and the former from American seed.

Decorticated Cotton Cake.—This cake, when well made and in good mechanical condition, may be considered one of the cheapest and most valuable foods at the farmer's disposal. Weight for weight, it contains a larger aggregate amount of valuable material than any other food. Until recent years these cakes contained as a rule 14 to 16 per cent. of oil, but now the quantity of this ingredient has dropped to about 8 or 10 per cent. Some degree of compensation for the comparative poverty in oil is the increased percentage of albuminoids, which range from about 40 per cent. to nearly 50 per cent., but deficiency in oil is often associated with a cake that is hard and "knotty."

The average composition of decorticated cotton cake at the present time is about 45 per cent. albuminoids, 9 or 10 per cent. oil, and 20 per cent. carbohydrates. At ordinary rates this is one of the cheapest foods in the market, though it is not suitable for calves, lambs, or other young stock,

unless given in small quantities, and in a finely ground condition.

It is most economically employed for dairy stock or fattening cattle, and as a rule should be accompanied by about an equal weight of some starchy food like maize or barley. When fed in this way experiments have shown that this food may be usefully employed both for fat stock and dairy cows. It is generally held to be superior to linseed cake where first rate samples of butter are required; it renders the butter firm and easily manipulated, and imparts good keeping qualities, and a high melting point. The very high quality of the manure made from this cake is a point that experienced farmers do not overlook. This cake is largely used in certain parts of the country, notably in Scotland; whereas in others it is rarely seen.

The chief points to be observed in purchasing decorticated cotton cake are: (1) to see that the cake is made wholly from decorticated seed; (2) to see that it is in suitable condition, and free from mould. With regard to the first point, the seed may not have been efficiently hulled, or the hulls may have been removed, ground up, and subsequently added to the meal, and the whole pressed into cake. Any appreciable quantity of coarse husks in the cake can be readily detected with the naked eye, but when the husks are present in a thoroughly disintegrated condition, their detection is only possible by chemical and microscopical examination. Cakes of this description exhibit a low percentage of oil (5 or 6 per cent., instead of about 10 per cent.), and a high percentage of fibre (18 to 20 per cent., instead of about 5 per cent.). Such cakes are practically little, if any, better than undecorticated cotton cake.

The hard button-like pieces sometimes found in decorticated cotton cake are extremely objectionable. To produce a softer cake some manufacturers have lately adopted the plan of grinding up the cake and repressing it into shape, while in other cases it is put on the market in a ground condition, and is often known as "yellow meal." As impurities are not so easy of detection in the meal as in the cake, it should be bought with greater caution. If the

cake is only moderately hard and can be passed conveniently through the breaker it may be crusted and left exposed to the atmosphere for a few days, when it becomes softer and more suitable for stock. When exposed to the air in this way decorticated cotton cake becomes darker in colour, and it may also be noted that freshly made cakes are much brighter than old cakes.

Undecorticated Cotton Cake.—The average composition of this cake may be put at about 23 or 24 per cent. of albuminoids, 5 or 6 per cent. of oil, and 30 per cent. of carbohydrates. The amount of woody fibre present is an important point; this is usually about 20 per cent., and should not rise much above that figure.

The most common faults of this cake are (*a*) excessive amount and coarseness of husk; (*b*) the presence of too much cotton fibre, due to imperfect ginning of the raw seed. After the first ginning process there still remains attached to the husk a fine downy layer of cotton fibre, and this is extremely difficult to remove. Thus there is always a possibility that the seed will not be efficiently cleansed of such cotton, which can be easily detected by the woolly appearance of the cake when broken across. Coarseness of husk, and husk in excessive amount, are serious objections, and have frequently been the cause of fatalities amongst stock.

The hulls present in this cake possess an astringent property which checks any tendency towards looseness in bowels; and for this reason the cake is useful when fed along with laxative food, such as fresh young grass in the spring, and the aftermath or foggage of hay fields. In many parts of the country undecorticated cotton cake is the feeding stuff most commonly used during the grazing season.

The comparatively low percentage of oil and albuminoids, and the high percentage of fibre, render undecorticated cotton cake much inferior to decorticated cotton cake as a feeding material. Many experiments have been conducted with the object of contrasting the two kinds of cotton cake as foods for fattening cattle. The evidence thus furnished is entirely in favour of the decorticated cake, which, irrespective of its

superior manurial value, was found to be worth £2 to £3 per ton more than the rough cake.

Rape Cake.—This cake is not now much used as a feeding stuff in this country, the objection to it being the frequent presence of mustard seed, and the disagreeable flavour that it imparts to milk. It is, however, a highly nutritious food rich in albuminoids, and if care be bestowed in its purchase, can be advantageously given to stock, especially sheep, as the experience of several successful farmers can testify.

Compound or Mixed Cake.—The use of cake of this description is apparently on the increase, at least in certain districts. Frequently some material, like ground linseed or cotton cake, is taken as a basis, and the bulk is made up of ground cereal grains, such as maize, barley, etc. As a rule the mixture is flavoured and sweetened by the admixture of spice, such as ground fenugreek or aniseed. Locust bean meal also is a favourite ingredient of these cakes, and of the mixed meals sold for lamb food and similar purposes. Locust beans are not often used alone, as their value is due rather to their giving a relish to other feeding stuffs, than to their actual nutritive contents. The sweet taste and pleasant aroma which accompany compound feeding cakes, and the high degree of relish with which they are consumed by cattle, largely account for their popularity amongst farmers. Many experienced feeders use large quantities of such cakes with the best results, but they should be bought with greater caution than is necessary in the case of pure cakes. They, of course, furnish an opportunity of getting rid of material (such as musty cake, warehouse sweepings, etc.) that cannot readily be sold in any other way, so that the buyer of compound cakes has a special inducement to deal with a firm of high reputation, and frequently to take the opinion of an experienced chemist.

Dried Grains and Malt Dust.—This food is obtained by removing the excessive moisture from wet grains or draff, to such an extent that only about 14 or 15 per cent. of moisture remains. Dried or desiccated grains may be looked upon as one of the cheapest, most reliable, and most wholesome forms of feeding stuff. They may be either brewery or

distillery grains; and, although consisting chiefly of barley, they may contain other grains, as also maize. The source from which the grains have been derived has apparently no great effect on their composition, although brewers' grains resulting from the manufacture of pale ale are usually rather superior to those from stout. The average analysis of dried grains is about 20 per cent. of albuminoids, 7 per cent. of oil, and 45 per cent. of carbohydrates. This represents a composition not very dissimilar from linseed cake; and, judging from experiments, it may be assumed that weight for weight the nutrient constituents of dried grains are about equal to those of linseed cake. That the value of dried grains is becoming more appreciated by farmers is evident from their advance in market price during the past few years.

Judging from their appearance alone one would not be inclined to credit dried grains with very high feeding properties; they are, however, very nourishing and digestible, and are greatly relished by cattle and sheep. They should always be bought on a guarantee, as they offer considerable temptation to adulteration with sweepings, bits of straw, and other low-class material.

A food very similar to the above is Malt Dust, Sprouts, or Combings, often pronounced "Cummins," which consists of the sprouts rubbed off barley malt.

Comparing average samples of dried grains and malt dust, the former is the superior food in about the proportion of 107 to 92; so that about 23 or 24 cwt. of malt dust are equivalent in feeding value to 1 ton of dried grains.

A very exhaustive series of practical feeding experiments, both with cattle and sheep, has been conducted in this country with dried grains, and almost without exception this food has proved more economical than any other concentrated food or mixture of foods. Dried grains alone, or, better still, mixed with decorticated cotton cake, have often proved superior to linseed cake both for cattle and sheep.

The Pulse Grains.—This term includes beans and peas, which must be looked upon as albuminoid foods. Excepting that they are poor in oil (about 1½ per cent.) they are somewhat

similar in composition to linseed cake. They are quite different in composition from the cereal grains, which they considerably surpass in feeding properties. The great estimation in which beans and peas, in the form of meal, are held for dairy cows is due to their producing a plentiful yield of milk, and butter of superior quality. Where it is intended to fatten cattle without cake or dried grains, some addition of beans or peas to the concentrated food is considered desirable by many farmers.

Cereal Grains.—These include wheat, rye, oats, barley and maize, which may all be grouped together as essentially carbohydrate or starchy foods. They contain roughly 60 to 70 per cent. of carbohydrates, 10 per cent. of albuminoids, and 2 to 5 per cent. of oil or fat. Maize is the most starchy food in the market, and is always most appropriately fed with a highly albuminoid food such as decorticated cotton cake. As a concentrated food for general feeding purposes a mixture of equal weights of these two foods can hardly be excelled.

Oats are considered the staple food of horses, but where corn has to be purchased, a mixture of beans and maize will often be found cheaper. Such a mixture, in the proportion of about $2\frac{3}{4}$ of maize to one of beans, constitutes a food very similar in composition to oats, and 16 cwt. of the maize-bean mixture is about equal in feeding value to 1 ton of oats.

The only stock to which wheat is, as a rule, given, is poultry, and for this purpose it is unexcelled by any food excepting, perhaps, short white oats. Maize is not a suitable food for fowls that are kept for egg-laying. The very small quantity of lime, and the low percentage of albuminoids in maize, largely account for its unsuitability as a food for young growing animals.

Treacle.—This is a substance that can often be made good use of. It holds about fifty per cent. of sugar, and consequently has considerable feeding value, and it is much relished by cattle. Mixed with water, and used at the rate of a pound per head per day to moisten chaff, it is a very useful addition to a diet, especially when roots are scarce.

Cod-Liver Oil.—Although cod-liver oil has not yet taken a

place amongst the staple foods of the farm, the attention of farmers may be drawn to the fact that several practical experiments have been conducted, showing considerable success from the use of this substance as a food for calves. The function of the oil is to supply the place of cream when rearing calves on separated or skim milk. It is given to the calves after they are about six weeks old, and in quantity up to 2 ozs. per head per day. The calves reared on separated milk and cod-liver oil do not gain in weight so rapidly as those fed on whole milk; but they will, if proper care be exercised, remain perfectly healthy, and they are reared at less than half the cost. Great advantage is gained by continuing to give the oil for some time after the calves have been weaned. The beef from animals fed in the early stages of their existence on cod-liver oil is in no sense inferior in quality to that from animals reared on whole milk.

BLACK DRY ROT IN SWEDES.

This disease was brought to my notice by Mr. Christopher Middleton, Secretary of the Cleveland Chamber of Agriculture, in a letter dated December 11th, 1901. He had seen the diseased crop a few days previously when valuing a farm at Naworth, on the property of Lady Carlisle, near Gilsland Station, N.E. Railway, and as it was quite new to him, he wrote to me, giving some particulars and asking me to visit the farm. Mr. Middleton at the same time communicated with the Board of Agriculture, and on December 18th I received a letter from the Secretary of the Board, suggesting that I might place myself "in communication with Mr. Middleton with a view to some examination of the crop being made, and advice offered, by the Agricultural Department of the Durham College of Science."

Owing to a heavy fall of snow, my visit to Naworth was postponed until December 31st, when, to my surprise, I found the swedes in exactly the condition in which they had been reported a month previously. Mr. Middleton had asked me to inspect as soon as possible, saying, "I think very shortly every turnip will be quite rotten." Instead of rotten turnips the field from the roadside appeared to contain an absolutely regular crop of moderate-sized, green-top swedes, which I would have estimated to weigh 19 or 20 tons per acre. Closer inspection showed, however, that every root in the apparently healthy crop was diseased.

The farm of Tryermain lies about 500 feet above sea level; there is not much arable land in the neighbourhood, and the six-acre field containing the diseased crop was the only field of roots in sight. The soil of the field was well adapted for turnips, it consisted of a light reddish loam 8 to 9 inches deep, resting on a thick stratum of gravel. The cultivation was

good, and the manuring (20 loads dung, 3 cwt., vitriolised bones, and 3 cwt. kainit per acre) had been suitable. The land had not been under turnips for seven or eight years; in the interval the field had lain for several years in grass, and everything, therefore, was in favour of the crop of 1901.

Two varieties of swedes and one of yellow turnips were sown, and the crop was a very promising one until checked by the dry weather of August and September. Mildew attacked the plants, but, though said to have been worse on the portion subsequently diseased than on the other part of the field, it was by no means bad, and the farmer saw nothing wrong until towards the end of September. Then, after some days of rain, he noticed that all the swedes lost their purple colour and turned a dull green; from that time they ceased growing, and underwent little outward change until the date of my visit, when every root had a rough "corky" green skin, and, of a number cut into, most were hollow and all were diseased. I examined the whole diseased area of about 4 acres very carefully, and I did not find one absolutely sound swede or turnip, except on a small patch of clay soil, where perhaps 1 or 2 per cent. of the roots were good. On one part of the affected area naturally moister than the rest, I looked for sound swedes, but saw none. It was easy to detect sound swedes in the field, apart from the colour. During the previous frosty weather the crop had been visited by hares, and every good swede had been freely sampled. None of the swedes on the diseased area had been eaten into, few had been touched.

The disease, a dark brown or black dry rot, which in the worst cases had eaten out the centre of the turnip, leaving only a shell, was apparently due to the attacks of one or more parasitic micro-organisms. Specimens have been submitted to Professor Potter, who reports below the results of his investigations.

The most remarkable fact in connection with this disease was that it suddenly ceased; almost in a straight line, which ran across the drills, the turnips changed to their natural colour, and about one-third of each variety of turnip sown was free from disease. On the unaffected part of the field a

good many plants had died from the attacks of *Phoma*, but I did not see a single specimen suffering from the black dry rot that had carried off every root a few yards away. The soil and subsoil were examined, but there was nothing to account for the sudden cessation of the disease, except the fact that the diseased portion had been limed, and that the sound portion had not; and from the appearance of the field and the evidence collected on the ground, I am satisfied that lime encouraged the disease.

The farm changed tenants some years ago, and particulars of the application of lime could not be obtained, but it was known that lime had been applied seven or eight years previously (probably before ploughing the land for the last turnip crop), and from the fact that lime was provided by the estate, it was inferred by the present tenant—who based his conclusions on the disposition of his predecessor—that the dressing had been a liberal one, probably 5 tons per acre.

From the isolated character of the turnip field, from the fact that both swedes and turnips (sown at different times) were diseased, and also from the fact that a part only of each row of turnips was affected, it seems quite clear that the crop became infected by the organism producing black dry rot through the soil, and there is evidence that the cause of infection was the dung used. The field itself has not been in roots for years, and the soil can hardly have been tainted; the dung, on the other hand, was made from a crop that was, in all probability, diseased.

The first symptom of disease is a dark, almost black, spot in the centre of the turnip. When I showed these spots to the farmer he remarked that most of his last year's crop had been "like that" when lifted, but that they had not got any worse, and had all been consumed. The attack, therefore, which came on late in the season, and did little damage last year, appears to have been the cause of the disease that ruined this year's crop.

Until the soil has been analysed, and the life history of the micro-organism responsible for the rotting has been investigated, it is impossible to say precisely why infected

dung proved disastrous on limed land and harmless on unlimed. It may be that the lime has injured—as it often does—the water-holding capacity of the soil, and that the roots suffered more from the drought of last summer, and so were open to infection. In favour of the view that the water-holding capacity has been interfered with, is the fact that the adjoining grass land has suffered from over-liming, and that a clay patch in the turnip field suffered less than the rest. On the other hand, the roots on a patch of silt—the site of an old tarn—which was much moister than the rest of the field, were all badly affected. On the whole I am inclined to think that the more probable connection between lime and the disease is due to the effect of lime, not on the host, but on the parasite. It is quite likely that the micro-organism responsible for black dry rot is one that flourishes only in soils well supplied with lime and so kept free from acidity.

In a letter dated January 5th Mr. Middleton informed me that he had seen a good many turnips affected with this disease on other farms in the Naworth district, though none so bad as Tryermain. It has not been reported to me from any other district.

Dung made from roots infected by the disease should not be used for growing turnips. The best plan would be to cart decayed roots on to permanent grass; or, if the field will not be used for growing turnips again for a number of years, they may be consumed on the land as soon as the disease is observed. When the crop becomes thoroughly diseased stock will not touch it, and it is only fit to plough in as manure.

T. H. MIDDLETON.

Microscopic Investigations of Black Dry Rot in Swedes.

Towards the end of December, 1901, some diseased swede from Tryermain Farm were submitted to me for examination. These I found to be attacked by the parasite fungus *Phoma*, an account of which I published in the *Journal of the Board*

of Agriculture (Vol. VI., No. 4). I was unfortunately unable to visit the field from which the diseased specimens were taken, and Professor Middleton kindly sent me further samples, this time specially selected by himself. These swedes presented a very different appearance. The rind was green, and curiously rough and furrowed, but beyond this there was nothing to indicate a diseased condition, and it was not until the roots were cut open that the actual state of things, and extent of the damage, was revealed.

A typical illustration of the attack in a well advanced stage is shown in the figure. As evidenced by its size, the plant had been attacked when fully grown. The centre presented a blackish mass of disorganised tissue, in which were numerous cracks and cavities, caused by the decay and separation of the cells from each other. This was surrounded by a brown area spreading outwards to the sides. The rind was firm, and retained the original shape of the root. In specimens in a more advanced stage, the cavities had coalesced and formed a large hollow, the whole of the internal tissues being destroyed, and the root reduced to a mere shell. The initial stages of the attack were indicated by dark spots and lines occurring in the central part of the "bulb" on the otherwise quite healthy flesh, and no sign of its commencement could be detected externally.

One somewhat striking feature of this disease is the fairly dry condition of the "bulb," which, even in the most advanced stages, does not become converted into the soft pulpy mass so characteristic of the "White Rot" (*Pseudomonas destructans*). The decay also, in this case, does not extend very rapidly; "bulbs" in which the disease was just commencing still remained partially sound after being kept three months in the laboratory.

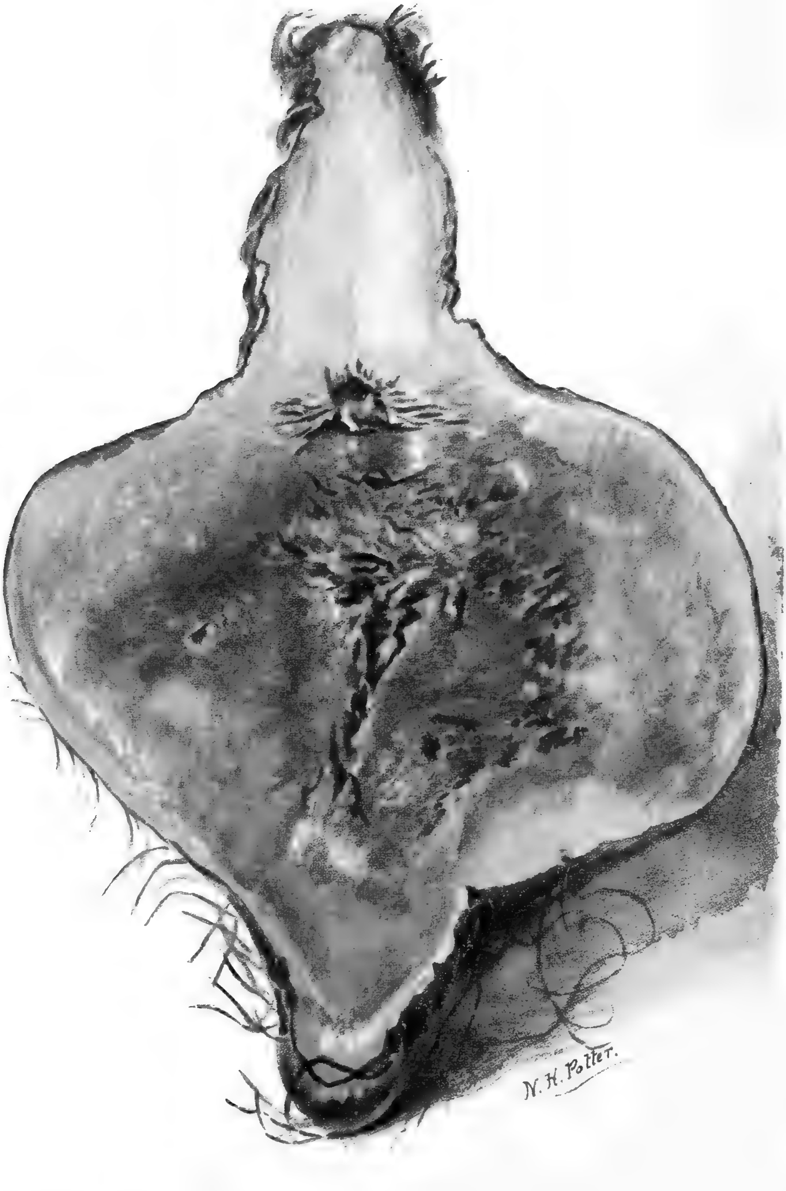
The infestation appears to have originated in the root fibres; as these became destroyed the supply of water from the soil would be diminished and gradually cut off, while the leaves would continue to evaporate water, and to this I am inclined to attribute the unusual dryness of the tissues. In the "White Rot" the conditions are very different; the attack commences at the crown, or at some part of the "bulb"

above ground, and the roots, being uninjured, continue to supply the "bulb" with water; hence the cells are turgid, and when dead become reduced to a sloppy mess.

An examination, by the microscope, of the small rough patches on the external surface of the rind of the infected swedes proved them to be due to local developments of cork, but the cells beneath them were quite healthy, and I am unable to suggest any satisfactory explanation of this special cork formation. In places, here and there, traces of the original purple colour still remained.

Microscopical examination of the internal diseased tissues showed that the cells were dead, the walls discoloured and brown, slightly swollen, and easily separable from one another. The protoplasm was also much discoloured. No trace of any hyphæ could be discovered, but innumerable bacteria swarmed in the cells and intercellular spaces. These bacteria were the only organisms present which might account for the appearances described. The presence of bacteria, however, afforded no proof that they were the cause of the disease; it was only by obtaining pure cultures of the bacteria, and observing their action upon the cells of healthy swedes, under special sterile conditions, that their degree of responsibility could be determined.

Minute portions of the diseased tissues, in an early stage of attack, were employed for a series of cultivations; and by means of cultures in a neutral turnip broth, rendered solid by gelatine, a bacterium was ultimately isolated which, when sown upon sterile blocks of swede procured from an entirely fresh source, gave rise to this particular disease. The rot commenced at the point of inoculation and gradually spread throughout the block. Its development, at first, was extremely slow; thus, in a set of ten blocks it was not until the fifth day after inoculation that the black-brown colour appeared, and the entire block was not completely rotten in seven weeks. But these experiments were carried out in an incubator at the constant temperature of 20° C. (68° F.) This temperature was too high, for when reduced to 15° C. (60° F.), the progress of the parasite was much more rapid.



Swede from Naworth attacked by Bacterial Disease.

The fact that in the experimental cultures the disease was much more virulent at a comparatively low temperature may account for its presence in the fields remaining unnoticed until the Autumn. Variations in temperature often exercise a very considerable influence upon the life and growth of micro-organisms.

Noting Professor Middleton's observation with regard to the effect of lime in fostering the disease, I prepared some experiments bearing on this point. The medium employed as described above contained an abundance of calcium carbonate. I now prepared a culture medium containing 1·25 per cent. cane sugar, 1 per cent. asparagin, and 5 per cent. gelatine, which would contain no lime; also a medium of the same composition, but, in addition, saturated with calcium carbonate. The bacterium grew vigorously in both these media, and no difference could be distinguished in the rate of growth between the two. The lime, therefore, has no effect upon the growth of the bacterium, but it appears to me probable that an explanation may be found in the chemical action of the lime in neutralising any acids in the soil and reducing the acidity of the cell-sap, thus rendering the plant more susceptible to microbic invasion. A further action would be to promote nitrification and therefore render an increased amount of nitrogen available as plant food, which would also diminish the resistance of the host plant. That lime spread abundantly upon the soil undoubtedly predisposes to bacterial rot of the potato has been shown by the investigations of Laurent. He found that, "as a general rule, lime diminishes the resistance to bacterial rot of the potato, carrot, and chicory. Nitrogenous manures and potassium salts have analogous effects, but less pronounced. On the contrary, phosphates increase the resistance in potato, carrot, and chicory, and the same is the case, but in a less degree, with chloride of sodium."

The special bacterium causing this rot in the swede is a short, motile rod 3 μ. by 1 μ. It is an ærobic form, liquefying 5 per cent. gelatine. Great difficulty has been found in staining the flagella, but by using the well-known methods of Van Ermengen and of Löwitt, I have been able to

determine the presence, of a single polar flagellum, and, hence, adopting Migulas Classification, it must be placed in his genus *Pseudomonas*. For special specific characters and determination of ferments, etc., a more prolonged investigation is required.

That the Black Rot is produced by this bacterium is established by the following facts:—

1. The bacterium is always present in the diseased tissues.
2. It has been isolated from the diseased tissues and cultivated in various media.
3. The disease is produced, with all its characteristic symptoms, upon healthy tissues, after inoculation with the bacterium from pure cultures.
4. The bacterium is found pervading the tissues in which the disease has been artificially produced by inoculation, and from these it has been re-isolated.

M. C. POTTER.

FARMERS' CO-OPERATIVE SOCIETIES.

The growth of voluntary co-operative associations of farmers for the promotion of their common interests has been a noteworthy feature in the history of agriculture during the past quarter of a century. This movement has hitherto found its greatest expansion on the Continent, where also it has been longest established. But within the past ten years there has been a remarkable development in this direction in the rural districts of Ireland, and the principle of combination has also been applied with success to the dairy industry in British Colonies and the United States. On the other hand, among agriculturists in Great Britain co-operation has not yet made much progress, though, owing to the efforts of the Agricultural Organisation Society, the advantages to be obtained by it are slowly becoming more generally recognised by British farmers.

Some of the earliest co-operative associations established on the Continent took the form of credit banks or agricultural loan societies, which now exist in large numbers in regions occupied by small holders and peasant farmers, particularly in Germany, Italy, and Belgium. Information as to the organisation and operations of these banks abroad has frequently appeared in this Journal, and an account of what has been done by some which have been established in this country is given on page 42. Briefly stated, their object is to enable their members to borrow small sums at a low rate of interest for the purchase of farming requisites.

Next to the banks, the most common, and perhaps the most effective form of combination amongst farmers is to be found in the joint purchase societies, or agricultural trading associations. Their usual function is to purchase *wholesale*, manures, feeding stuffs, seeds, implements, and other articles

used on the farm. By purchasing in large quantities direct from the manufacturer, these societies are able to save the profits of intermediaries and agents, and thus obtain supplies for their members at wholesale prices. In this way they not only help the small farmer to procure his manures and feeding stuffs at a more moderate price than he could do by purchasing for himself alone, but they also save him a large part of the incidental charges usually incurred by the individual buyer in the carriage and testing of the goods. For instance, only one analysis is required of a fertiliser consigned in truck-loads to the society to test the quality of the several portions of the consignment bought on behalf of individual members, while each member's purchase benefits by the lower rates of carriage obtained by collecting sufficient orders to make up loads of five tons and upwards.

Co-operation in production has been applied with greatest success to the dairy industry. The remarkable development of the butter trade of Denmark is attributed largely to the establishment of co-operative dairies and creameries, which have enabled the farmers of that country to supply the British market with immense quantities of butter of uniform quality and consistency. Uniformity in flavour, in appearance, and in quality, is the characteristic most required in butter intended for general consumption in the great towns of this and other countries; and it is obvious that this is more likely to be secured by manufacturing the article in dairies which can manipulate the milk supplied by a large number of farmers, than if each of these farmers himself makes butter from the milk produced on his own farm. A full account of the organisation and methods of the Danish dairy societies, and of similar associations in Sweden and Germany, is given in a special report published by the Board of Agriculture, and articles showing the progress of co-operative dairying abroad, in the colonies, and in Ireland, have appeared from time to time in the pages of this Journal. Except in the case of butter and cheese-making, little advance has been made in the application of co-operative principles to productive processes in agriculture. Danish farmers have, however, associated for the curing of bacon

for export, and there are also instances abroad of agriculturists having combined with satisfactory results for the prosecution of such businesses as milling, baking, distilling, the preservation of fruit and vegetables, sugar refining and the manufacture of starch.

Co-operation in the sale of general agricultural produce presents difficulties which have not yet been successfully overcome. When it is remembered that corn, vegetables, and meat are usually sold wholesale in separate markets under entirely different conditions, it is not surprising that comparatively few farmers' associations have attempted to undertake the sale of all these articles on a large scale. These difficulties are less operative in cases where the societies have confined their business to a single class of produce, such as butter and eggs, and the wholesale disposal of these products on co-operative lines has been organised with success. Though where this business has assumed large dimensions, as in the case of the sale of butter manufactured in the Danish and Irish dairies, the work of distribution is undertaken by special agencies formed solely for that purpose, to which the dairies consign their produce. This form of co-operative distribution is one which offers great possibilities in connection with the question of the economic carriage by rail of agricultural produce. Many of the complaints made by farmers of excessive and preferential railway charges arise from the fact that the consignments concerned are not sufficient in bulk to enable the companies to handle them with profit at the lower charges at which they convey larger consignments. In such cases the remedy would frequently be found in the formation of a co-operative distributing agency which would undertake the collection and packing of small consignments to make up truck-loads for dispatch at regular intervals.

Retail trading has been taken up by some co-operative societies in dairying districts on the Continent, through the medium of the parcels post, and this means of reaching the consumer direct has also been employed for the distribution of fancy cheeses, honey, eggs and fruit.

Among the other co-operative institutions established by

farmers on the Continent, perhaps the most important are the associations for the improvement and insurance of live stock, which are more numerous in France and Belgium than elsewhere. As a rule cattle are the animals with which these associations are concerned; only in a few instances are horses, sheep and swine included. In the case of the Belgian cattle insurance societies, which may be taken as a type of these institutions, the usual compensation allowed to members for the loss of an animal is two-thirds of its value, and this is paid out of the funds of the society, to which all the members make periodical contributions. Another method adopted by some societies is to pay the compensation out of the common fund only when the animal is declared unfit for food; but if the meat is suitable for human consumption it must be purchased by members of the society, each contributing to the price a sum proportionate to the number of animals he has insured in the society. In some societies there is, however, no common fund, and then the practice is to compensate the owner of a condemned animal by levying a subscription on all the members to make up its value if the meat has been seized; or if the meat may be used for food then the society purchases the carcase and distributes the meat amongst the members at an agreed price. The system of cattle insurance most popular in Bavaria and certain other parts of Germany and Austria is described on p. 60.

All the forms of association to which reference has been made have been adopted to a much greater extent by farmers abroad than by the agriculturists of the United Kingdom, and are one important cause of the success of the foreign competition in fresh agricultural produce, such as butter and eggs, which is now felt to so large an extent by the home producer. The co-operative movement has, however, made much progress amongst Irish farmers since the work of organisation was taken up by the Irish Agricultural Organisation Society in 1894. At the end of 1900, there were in Ireland 499 farmers' co-operative societies, with 46,206 members. These included 106 agricultural societies, 263 dairy societies and auxiliary creameries, 76 agricultural banks, 21 poultry

societies, and 38 societies for the development of the flax industry, fruit growing and for the promotion of home industries.

The chief function of the agricultural societies in Ireland is the joint purchase of agricultural requisites, especially manures. Some of these societies have also undertaken sales of live stock; others have been useful in procuring implements and spraying machines, which are hired out to the members at a small charge; and three have hired grazing lands and let them out at reduced rents to their members.

The Irish dairy societies or creameries, whose main business is the manufacture of butter, are organised on the lines of similar associations in Denmark, and their process of butter-making follows closely the Danish system. Few of the Irish dairy societies were started with sufficient share capital to cover their outlay in buildings and machinery. In many instances, credit was obtained from the contractors, or the extra capital required was raised by means of a loan from a local bank. The shares in the dairies are owned, for the most part, by the members. In some cases, persons who do not keep cows hold shares, but they have become shareholders to help the associations as local institutions rather than for the purpose of investment. Shares are usually taken up by farmers in proportion to the number of cows they keep, at the rate of 1*l.* for each animal. This arrangement, however, is not uniform in all the societies. It is the practice to pay for the shares by instalments, generally of five shillings at a time. After the creamery has been started, these instalments are frequently paid in milk: sometimes a reduced price is allowed for the whole of the milk delivered, and sometimes the member delivers a certain quantity free of charge, until the call on the share is paid up. The liability of the farmers is, in all cases, limited to the amount of their shares.

The accounts for 1900 of 171 of these dairy societies showed a membership of 26,577, with a paid-up capital of £74,223, and a loan capital of £46,262. The value of their buildings and plant, after allowing for depreciation, was estimated at £129,528. The quantity of milk handled by them in the year was 35,630,000 gallons, from which 13,601,000 lbs. of butter

were produced. The average price paid to members for milk delivered to the societies was 3·84d. per Imperial gallon; and the net profit on the operations of all the societies, after deducting working expenses, was £12,472.

The co-operative poultry societies in Ireland have confined themselves as a rule to the collection and sale of eggs on behalf of their members, but some of them have recently embarked in the table-poultry trade. They purchase eggs as well as poultry from their members *by weight*, and the introduction of this practice is said to have had the effect of making poultry-keepers more interested than before in the breed of fowls they keep.

In every case the price paid for the eggs sold through the societies has been above that obtained before they were started. It is claimed that the societies have accomplished an incalculable amount of useful work for the poultry industry of Ireland by raising the standard of quality; by introducing new and improved methods of keeping fowls; and by procuring for their members birds of serviceable pure breeds.

In Great Britain the co-operative movement has hitherto advanced very slowly amongst agriculturists. There are, however, several old-established associations for the joint purchase of manures in England, and a number of similar bodies exist in Scotland. Among the English institutions of this class, one of the oldest is the Lincolnshire Farmers' Association, established in June, 1868, for the purpose of purchasing genuine phosphatic manures of guaranteed quality, and supplying the same to its members at cost price. This society is organised on a strictly co-operative basis: no profit is made on its transactions, and the working expenses are defrayed by an entrance fee of twopence per acre on the land occupied by each member, and by a fee of one shilling per ton on the goods ordered. All manures are analysed free of cost to the members, and delivered carriage free within a certain area. In 1901 this association distributed 6,400 tons of superphosphate to its members, and its accounts for that year show a turnover of over £19,000. It is maintained that by the influence of the Lincolnshire

Farmers' Association, the price of manures has been considerably reduced, and that consequently thousands of pounds have been saved by the members, and by others connected with the cultivation of land within the sphere of the association's operations.

A few other Farmers' Supply Associations exist in various parts of Great Britain, but most of them differ from the Lincolnshire Association in the sense that they are run as large stores or companies with considerable share capital upon which dividends are paid.

In addition to these large associations, there are to be found, here and there, in some of the western counties of England, local manure clubs working on a small scale on the lines of the Lincolnshire Association; and a number of analytical societies of the same type exist in Scotland. But the benefits to be gained from the formation of societies of this class have not yet been recognised by the great body of occupiers of small holdings and allotments south of the Tweed, amongst whom there is a great scope for all forms of co-operation.

The task of organising co-operative associations of small farmers in Great Britain has been recently taken up by the Agricultural Organisation Society, which has been founded for the same purpose as the kindred society in Ireland. The objects of this society, as stated in their report, are to secure the co-operation "of all connected with the land, whether as owners, occupiers, or labourers, and to promote the formation of agricultural co-operative societies for the purchase of requisites, for the sale of produce, for agricultural credit, banking and insurance, and for all other forms of co-operation for the benefit of agriculture." The society carries on its work by sending organisers to address meetings and to give advice as to the proper course to be pursued in the formation of local societies; by providing model rules for such local societies; and by publishing leaflets from time to time dealing with the various forms of agricultural co-operation. The local societies affiliated to this central organising agency already number 32, including 24 co-operative agricultural trading societies or joint purchase associations; six

dairy associations, one entire cart horse society, and one land association. Many of these bodies have only recently commenced operations; but as an example of the advantages of co-operation to the small farmer, reference may be made to the published accounts of the work already accomplished by two or three of them.

The Muskham Agricultural Society may be quoted as an example of an agricultural trading association. This was started in May, 1899, with 17 members and a share capital of £16. In 1900 the membership had increased to 38, and the turnover amounted to £365. One of the first steps taken by the society was to purchase a reaper and binder with money borrowed from a bank on the joint personal credit of the committee. The scale of charges for the hire of the machine was fixed by the committee at the rate of 4s. 6d. per acre last year, the society providing twine and a man to take charge of the machine and horses. The result of three seasons' work has been that the society has liquidated the debt to the bank and the machine now belongs to the members, who can avail themselves of the use of it at a nominal charge just sufficient to cover wear and tear. Some of the agricultural trading societies are also able to assist in the improvement of the live stock kept by small farmers by purchasing or hiring first-class bulls, boars, and stallions. The Tregaron Agricultural Society, a small co-operative body of 50 members holding shares of 5s. each, of which 1s. 6d. is paid up, has, in addition to its business in manures, cakes and seeds, secured for its members, free of charge, the services of a boar, which is hired out to non-members at a fee of 2s. 6d.

Among the affiliated dairy societies, mention may be made of the Brandsby Dairy, in Yorkshire, which is chiefly engaged in the sale of butter, cream, and cream cheese on behalf of its members, but also undertakes to supply them with manures, feeding stuffs, and other farming requisites. A small warehouse has been rented by this society from the railway company, in which the manures, cake, and other articles purchased in bulk are stored, and from which they are distributed to members as a return-load for their carts which have brought produce to the station. By pur-

chasing in truck-loads and relieving the dealer of the risk of bad debts and the trouble of collecting small sums of money from a number of individual buyers, this society has been able to obtain reduced quotations by which every member has benefited, however small his purchase. The balance-sheet of the Brandsby Dairy Society for the half-year to January 31st last shows a turnover of £1,728 and a profit of £46 after allowing £24 for depreciation.

The local societies affiliated to the Agricultural Organisation Society are registered under the Industrial and Provident Societies' Act, and can therefore sue and be sued as corporate bodies.

The foregoing examples are sufficient to afford some idea of the directions in which farmers, and particularly occupiers of small holdings, can effectively combine to their mutual advantage. Hitherto the Agricultural Organisation Society* has been working single-handed to encourage and assist such combination, but its efforts can now be seconded by County Councils in rural districts where co-operation is likely to be useful, as the Board of Education are prepared to sanction the teaching of the principles and practice of agricultural co-operation in the case of all County Councils which may make application to them in terms of Section 8 of the Technical Instruction Act, 1889, with are presentation that such a form of instruction is required by the circumstances of the district.

* The secretary of the Agricultural Organisation Society, Dacre House, Dacre Street, Westminster, to whom the Board are indebted for assistance in the preparation of this article, will be pleased to furnish information and afford advice to persons interested in the formation of agricultural co-operative societies.

AGRICULTURAL CREDIT BANKS.

Although the advantages of co-operative credit have for several years been urged upon those interested in the welfare of our rural districts, considerable ignorance still exists regarding the constitution of agricultural credit societies, and the benefits they are capable of conferring.

The testimony to the success of this form of popular economic activity in Germany and other Continental countries is so widely known that it is needless to repeat it here.

Any who may happen to be unacquainted with the progress of the movement abroad could not do better than refer to Mr. Henry W. Wolff's writings on the subject.

But many who have read these and other glowing records of the chroniclers of Continental co-operative credit have not yet quite arrived at belief in its practicability for this country. The contrast between the conditions and character of the English labouring classes and those of Germany, France, Italy, Denmark, and other countries where co-operative credit flourishes, is supposed by some to be a barrier to its equal success with us.

The best way to overcome the theoretical prejudices of these and other objectors is to demonstrate by practical experience that their fears are groundless.

This has already been done to a small extent in England, and on a more extended scale in the sister isle.

Before describing the structure of agricultural credit societies and the best methods of establishing them in greater numbers, a short *résumé* of some of the transactions of English village banks affiliated to the Co-operative Banks Association (of which Mr. R. A. Yerburgh, M.P., is chairman) will give an idea of their possibilities of usefulness.

The first village agricultural credit society in England was founded in July, 1894, at Scawby, Lincolnshire. It had

to encounter all the difficulties of a pioneer effort, and to-day, after eight years' successful working, is more highly appreciated by its members than ever.

On his recent tour through the agricultural counties Mr. H. Rider-Haggard visited this little co-operative bank, and was loud in his praises of the good which it had effected by assisting quite a number of industrious struggling folk to advance themselves in life in an independent manner. In a subsequent article describing his investigations he quoted three cases in which the bank had been of considerable service to its members.

Case 1.—A farm labourer, an industrious man, who had brought up a large family, had managed to save a little money. He took half an acre, then three acres and the proverbial cow; then, when nearly sixty years of age, seized the opportunity to hire a small farm of fifty acres, which he managed to enter and stock, except with sheep. To purchase these the Scawby Society granted him a loan of £30 on the security of his live and dead stock and corn in stack, which he insured at the instance of the society for £150.

But for this loan the borrower would have had to sell his sheep food to his own loss, and to the damage of the farm. Having punctually discharged his debt, he applied for a fresh loan of £40 again to buy sheep, as his roots were more plentiful than in the previous season. The loan was granted on the same security as before, and duly discharged.

A further loan of £20 was granted, and paid off to the day. After a year, the borrower saw a chance of placing his sons on a small farm, which he partially stocked for them. In order to do this, however, and replenish his own holding, he applied for another loan of £50, which was granted on the same security. This chain of loans, therefore, assisted in starting the tenants of two small holdings, and it is estimated that if the original borrower were now to go out of farming, after six years, he would be found to have quadrupled the capital with which he started.

Case 2.—A working foreman heard of the Scawby Credit Bank, and deposited with it a sum of £50. When the chance offered of taking a farm of seventy-three acres he borrowed

£50 on the security of his deposit, and a further £50 on that of his stock and implements and the guarantee of two sureties. Even in the present bad season this man's farm looks well, and, as he is hardworking and knows his business, his success is fairly certain.

Case 3.—A foreman in a commercial concern established himself independently in the same line of business, and locked up his small capital in manufactured goods of his own production. He was granted a loan by the Scawby Society on the security of his stock in hand and of two sureties. This loan was repaid, and a fresh one for a smaller sum granted, which, after an extension of time, asked for on the ground that it would enable the borrower to establish himself, was duly repaid. This man has now secured a connection of customers, and has a good prospect of success.

But for these loans he would have been obliged to sell his first manufactured stock at a sacrifice, and must have drifted to his old position, and thus lost the independence he coveted. From the last balance sheet we observe that the loans to members during the year (varying from £7 to £50) amounted to £107. The interest charged has been 6 per cent., and as the officers have all been honorary, a small reserve fund has accumulated.

The Wiggenhall Agricultural Credit Society, established May, 1896, in the Norfolk village of that name near King's Lynn, is another example of the utility of co-operative credit. The committee of management is composed of the vicar, two market gardeners, two small holders who are also skilled agricultural labourers (one a shepherd, and the other working at dyking, fencing, thatching, etc., by the piece), and two labourers who also occupy allotments, with a local estate agent as honorary secretary.

The president of the society at a recent annual meeting lamented the fewness of similar institutions, and remarked that if there were more of them about it would be for the benefit of small holders generally, adding that an industrious man who might often turn an honest penny if he had the means, could, where these banks were in existence, borrow small sums in the same way that a large farmer could go to

a bank and obtain what credit he wanted. Loans have been granted for the purchase of beasts, sheep and pigs, for hire of horse labour on small holdings and allotments, and for repairing and improving glass houses.

The following are three instances of productive advances to members :—

Case 1.—One member borrowed £10, and bought some ewes, which with their produce more than doubled the amount before the time of repayment (12 months) arrived.

Case 2.—A £20 loan to another member to repair his cucumber and tomato houses, prevented them going further into decay, and probably getting past repair. They are now full of plants, and looking very prosperous.

Case 3.—A £5 loan to a member five years ago bought his first sow, and he has had pigs ever since.

Many other similar instances could be given of the beneficial effects of small advances did space permit.

The number of members in the society last year was 50. Nine loans varying in amount from £5 to £20 were granted by the committee of management at 6 per cent. interest, and the reserve fund on December 31st, 1901, was £10 9s. 1d.

Another of the Agricultural Credit Societies affiliated with the Co-operative Banks' Association is at Hedge End, in Hampshire. It was established in February, 1896.

The appended statement of its receipts and expenditure last year, and capital account at the beginning of 1902, will give a good idea of the small, but useful, financial operations of an English village bank.

Secretary's Cash Summary.

From January 1st to December 31st, 1901.

Receipts.

	£	s.	d.
To Balance as per last Account	0	8	11
Loans repaid	171	0	0
Interest on Loans	8	10	2
Entrance Fees	0	5	0
Deposits	17	0	0
G.P.O. Interest	0	5	0
	£197	9	1

Expenditure.

				£	s.	d.
By Loans advanced to Members				146	10	0
Interest on Deposits				4	14	0
Printing				0	4	6
Affiliation Fee to Co-operative Banks' Association				0	5	0
Cash at Bank	5	10	7			
Cash in G.P.O.	40	5	0			
				45	15	7
				£197	9	1

Capital Account.

Statement of Liabilities and Assets on December 31st, 1901.

	£	s.	d.					£	s.	d.
Deposits - - - - -	162	0	0	Loans outstanding - -				130	0	0
Balance in favour of the Society - - - -	15	12	4	Interest due on Loans - -				1	16	9
				Cash at Bank -	5	10	7			
				„ in G.P.O., with Interest	40	5	0			
								45	15	7
	£177	12	4					£177	12	4

The number of members last year was 30, and the loans granted were from £4 10s. to £40, the interest charged being 6 per cent.

The Castle Morton Agricultural Credit Society (Worcestershire) has for many years proved a useful help to the small holders and labourers of the locality. It has often enabled its members to keep their sheep for a more favourable market, and to purchase pigs and manure when they could not otherwise have done so.

The loans granted for these and other purposes have been from £2 to £10, and instalments have been repaid punctually.

Mention might be made of another serviceable little society of this character at Laxfield, Suffolk, and also of one only recently formed at Freeby, near Melton Mowbray, Leicestershire.

The operations of these half-dozen English village banks conclusively prove the practicability of this form of self-help in our rural districts. Their benefits are more than those represented by the financial profits which they enable their members to make. They cultivate that friendly social spirit, as much needed in our villages as elsewhere, and bring together for their mutual encouragement men who would alone frequently fail to make a successful struggle. Further than this, they educate the people in those business and administrative habits so necessary for the management of their own affairs, and prove in a very practical way the value of honest industry, punctuality, and attention to detail.

When those of us who are inclined to be discouraged at the slow progress of the movement in England remember that it took 26 years before the German Agricultural Loan

Banks, which are now so flourishing, began to multiply on a large scale, it teaches us patience, and makes us hope that the English labourers will ultimately be as energetic in this direction as their Continental brethren.

The comparative smallness of our villages, and the fact that we have a far less number of small cultivators, either tenants or freeholders, and fewer village industries, are some of the difficulties to be overcome. There are also two other factors which, without becoming controversial, we might mention in this connection, and those are the greater class distinctions of our social life and the non-co-operative disposition of our people.

None of these difficulties are insuperable, as has been proved by the banks already established. There are hundreds of villages large enough for Agricultural Credit Societies, and endless openings for public-spirited, social leadership in bringing the people together to form them.

How to Start a Village Co-operative Bank.

Anyone desirous of promoting a Village Co-operative Bank should (after distributing the explanatory country leaflet of the Co-operative Banks' Association) convene a meeting of those likely to be suitable members, to discuss the desirability of founding a rural credit society of this character.

At this meeting a statement of the principles of the movement (which the convener should have carefully studied beforehand) should be made. If the formation of a society is approved a resolution should be passed, appointing a provisional committee to consider the best basis for its establishment.

The provisional committee should consider the special wants of the neighbourhood, and the best system to be adopted to meet them. It should then take steps to ascertain whether there is likely to be sufficient support to render it possible to commence work effectively. If this be decided in the affirmative, the recommendations of the committee should be reported to a public meeting, to be called in the parish.

This might be usefully attended by a representative of the Co-operative Banks Association, to advise on any points or answer questions which might be raised as to the working of the system.

If this meeting approve of the formation of a Village Bank a committee should be appointed by those who give in their names as willing to join to draw up the necessary rules for its constitution. A treasurer should also be elected, and the elected committee should appoint a chairman and secretary.

The next duty is to consider in detail the model rules issued by the Co-operative Banks Association, and adopt them with approved additions or otherwise.

The most important matter in connection with the rules concerns their registration under the Friendly Societies Acts. These rules are prepared in such a form as will enable them to be registered without alteration by the Chief Registrar, 28, Abingdon Street, London, S.W. Rules must not be issued with the name and address of the Society till the registration certificate is received.

Other regulations which do not affect the constitution of the Society may be made apart from the rules, and do not require to be registered.

It is not possible in a short article to go into the details of the simple book-keeping required by these Societies, and the various forms required for the conduct of the business of the Bank. Specimens of the same will gladly be forwarded by the Co-operative Banks Association, Westminster, without charge to anyone desirous of receiving this detailed information. It may, however, be stated that they consist of rules, prospectus, membership application form, application for loan, approval of application, loan agreement forms, loan and deposit cards, and a set of books.

When the above preliminaries are settled the Bank is ready to begin business, and to deal with applications of its members who are able to make profitable use of productive credit.

It is hoped that in time the people will have so much confidence in these popularly constituted banks that they will

deposit their savings in them, receiving, of course, due interest on the same. This has already been done on a small scale with the existing Societies.

To commence with, however, they will have to borrow a certain sum of money, either from an ordinary banker, or from some local friend or friends willing to lend, or place it on deposit with them, on the collective security of the members. The amount they are able to secure in this way depends upon their character. A number of honest men, however poor, can, by forming an Agricultural Credit Society on these lines, command a certain credit which will increase or diminish according to the ability with which they manage their own financial affairs. Hence the importance of great carefulness in the admission of members, honesty and industry being the two main qualifications required.

Every member of the bank is entitled to apply for a loan, but he or she must satisfy the committee of management that the purpose for which it is required is a sound one, and the money must not be spent in any other way than that for which it has been granted, and must be repaid at the time agreed upon.

The money is lent at as low a rate of interest as possible, as the object of Co-operative Banks, unlike others, is not to make a profit out of advances, but to help the borrowers. Most of the loans are made upon the personal security of one or two sureties.

The extension of the system for assisting the agricultural districts with cheap credit will undoubtedly involve the creation of a central Co-operative Bank to finance the local societies.

In continental countries the advantage of aiding the inhabitants of rural districts in this way is so strongly realised, that large loans are made by the Governments at a very low rate of interest (subject to adequate supervision) for the purpose.

In England such matters are left to private enterprise, and it is confidently believed that as the benefits of the movement become more widely known this will be sufficient, coupled with the surplus deposits of the Town Co-operative

Banks, to deal with the problem economically. But apart from these well secured loans, a certain expense is incurred in organising the system, and spreading information throughout the country on the subject. The cost of this falls upon the Co-operative Banks Association, the smallness of whose funds is one of the principal causes of the comparatively slow growth of the movement.

This economic form of self-help would be aided by the removal of certain heavy restrictions in connection with the registration of Agricultural Credit Societies. At present, unlike ordinary Friendly Societies, they are much handicapped by having to pay a registration fee of £1, and 10s. for every amendment of their rules. They are also charged stamp duty on their receipts and agreements, which adds considerably to the charges which they have to make for small loans, besides being denied priority of claim against estates of officers. Representations are being made to the Treasury on these points.

The British mind is notoriously slow in adopting new ideas, but makes up for this defect by steady persistency when once it is convinced of the practical utility of a scheme. Co-operative credit is no fad of the visionary enthusiast, but it requires much thought, time and trouble expended upon it, especially in its early stages, all of which will be well repaid by results.

We have confined ourselves in this article to a description of small Agricultural Credit Societies, but the principle is capable of adaptation for the benefit of those engaged in larger operations.

HENRY C. DEVINE.

FEEDING TRIALS WITH DAIRY COWS.

During the past winter a trial on the feeding of dairy cows was carried out at Chipping Norton, under the direction of the Agricultural Department, Reading College. The main object of the trial was to gain information as to the best and most profitable combination of foods for winter feeding of milch cows, and to ascertain the influence of the foods employed on the percentage of butter fat. At first it was thought desirable to test a large number of foods, but owing to the complications involved in a trial of this nature it was finally decided to restrict the trial in the first place to the following rations—

Daily rations per cow employed in the trial.

Food.	Preliminary.	Lot I.	Lot II.	Lot III.
Mangels	28	28	28	14
Brewers' grains	—	—	—	20
Oats (ground)	1½	4	2	—
Wheat	1	2	1	—
Beans	—	3	—	—
Cotton cake (decorticated)	—	—	5	5
Molassine Meal	2	—	—	—
Thorley's Food	1½	—	—	—
Barley straw chaff	6	6	6	6
Hay	20	20	20	20

Twelve fairly large cows were selected and divided into three lots. Each lot contained one recently calved cow, two that had calved about two months, and one that had calved about four months before the trial began.

The trial commenced on January 5th. During the follow-

ing four weeks all the cows were kept on their old ration described in the above table as the "preliminary ration," in order to test the relative milking capacities of the three lots. On February 2nd, the trial rations were commenced and continued for eight weeks. Rations I., II. and III. were fed to the corresponding lots of cows during the second period. The whole of the rations were too liberal and had been so arranged after taking into consideration the amount of food the cows were receiving at the time the trial began. All the cows put on a considerable amount of flesh during the progress of the trials.

The morning and evening milk of each cow was weighed and the weight recorded throughout the trial, but as the cows took more than a week to become accustomed to some of the foods in the new rations, the weights of milk yielded during the first two weeks that these rations were fed have not been included in the results.

The average yield of milk of each lot (1) during the feeding of the preliminary ration, and (2) during the period when the trial rations were satisfactorily consumed was as follows :—

	Average Weekly Yield of Milk during Preliminary Period. lbs.	Average weekly Yield of Milk during Period when Trial Rations were used. lbs.
Lot I.	811¼	759
„ II.	854	871¾
„ III.	791	754¼

During the feeding of the preliminary ration the milk yield of Lot II. was greater by 5·3 per cent., while that of Lot III. was less by 2·5 per cent., than that of Lot I. While they were receiving the trial rations, Lots II. and III. improved their yield in proportion to that of Lot I., Lot II. to the extent of 9·6 per cent., and Lot III. by 1·9 per cent. The average weekly yield of Lot II. was greater by 17¾lb. during the feeding of the trial rations than it was in the previous period, although the difference in the average dates of the two periods is seven weeks; a length of time during which the milk yield might be expected to fall off considerably.

The following table shows in a convenient form the main features of the results:—

	Average Daily Yield of Milk per Cow during Fourth week of Preliminary Feeding.	Average Daily Yield of Milk per Cow during the Fourth week of Feeding Trial Ration.	Cost per Day of Trial Rations.
	Gallons.	Gallons.	s. d.
Lot I. -	2·767	2·550	1 2·39
Lot II. -	2·920	3·095	1 1·06
Lot III. -	2·564	2·665	1 0·11

The results of tests for butter fat are shown below.

	Lot I.				Lot II.				Lot III.			
Stall Nos. of Cows.	1	15	13	22	32	24	11	20	17	27	29	26
January 16, Morning	3·5	3·1	3·1	3·0	3·4	3·9	3·15	3·8	6·3	3·55	3·0	3·7
February 26, "	3·25	3·05	3·8	3·6	3·55	3·5	3·55	2·95	2·55	2·7	3·0	3·55
March 26, "	3·3	5·0	3·65	3·5	3·55	3·2	3·4	3·6	2·4	3·05	3·5	3·95
January 16, Evening	3·6	3·35	3·5	3·0	3·55	4·2	3·3	3·95	6·0	4·9	4·05	4·2
February 26, "	4·0	4·95	3·75	3·6	4·0	4·2	3·75	3·45	2·95	3·85	3·05	4·1
March 26, "	3·8	5·6	4·0	3·65	4·7	4·65	3·9	4·25	2·8	3·9	3·05	4·3

From these results it would appear that the percentage of fat in milk, even in that of the same cow, varied greatly from causes other than food. For example, on January 16th, cow 17 gave a richer milk than any of the others, but on the other two dates on which the milk was tested her milk was the poorest. The richness of her milk on the first date was accounted for by her having taken a chill and yielded rather less than half the usual quantity. In the case of cow 15 also there was a great difference in the quality of the milk yielded on the dates of the first and last tests, resulting from some cause which has not been traced. The evening milk of the cows was, with only three exceptions, richer than the morning milk, but the extent of difference in quality was very variable ; it differed considerably with the various cows

and even with the same cow on different occasions. The interval from the morning to the evening milking was shorter than that from the evening to the morning, but the times of milking were fairly constant.

Experiments to determine the influence of food on the quality of milk were also carried out last year on the herd of cows belonging to the South Eastern Agricultural College at Wye. These experiments began on October 20th. Six cows were selected for the purpose, their stall numbers being 1, 25, 31, 34, 35, and 38. On October 20th when the experiment began, all six cows were lying out at grass day and night, and receiving in addition to pasture a daily ration of 56 lbs. cabbage, 4 lbs. bean meal, and 3 lbs. barley meal. On November 2nd, they were all taken in at night, when 7lbs. oat straw was added to the ration to make up for loss of grass; and in order to act as a check or standard, two of the cows, Nos. 34 and 38, were kept during the whole period of the experiment on this combination of foods.

On November 4th, cows Nos. 1 and 35 were given in addition to the foregoing, 6lbs. of maize meal daily, while Nos. 25 and 31 were given 4 lbs. linseed cake instead of the maize meal. After a month the rations were reversed; the maize meal was fed to cows Nos. 25 and 31, and linseed was given to Nos. 1 and 35; and these diets were continued in each case till the close of the trial on December 22nd. The changes of food were made to test the effects on the milk of an actual increase in the quantity of food given, and of a change from a high to a low albuminoid ration.

The table below shows the weight of milk per week produced by each cow, and the percentage of butter fat.

It would appear that, in accordance with general experience, a fall in the yield of milk was accompanied by a rise in the percentage of butter fat. The marked drop in the percentage of fat in the third week is said to be probably due to climatic influence, as raw, foggy weather was experienced at that period.

The results of the trials generally tended to demonstrate that a change from a low diet in point of quantity to a more plentiful one, or a change from a medium diet in albuminoids

either to one poorer or to one richer in albuminoids, does not affect the yield of butter fat to any appreciable extent. It is held therefore that these experiments in so far as they go support the view that the amount of butter fat a cow gives is not materially dependent upon the nature of her food, but is governed by other causes, such as the period of lactation, and the cow's individual aptitude to produce richer or poorer milk.

WEIGHT OF MILK PER WEEK.									
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Cow No. 1 -	159	161	164	159	160	146	159	153	162
,, 35 -	86	95	106	80	—	—	—	—	—
,, 25 -	116	98	117	110	111	100	87	67	44
,, 31 -	151	156	153	141	158	150	157	138	134
,, 34 -	167	168	152	137	147	141	124	119	116
,, 38 -	149	152	151	141	149	132	143	142	143
PERCENTAGE OF BUTTER FAT.									
Week	1	2	3	4	5	6	7	8	9
Cow No. 1 -	2·91	3·18	2·91	3·03	3·45	3·24	3·48	3·61	3·30
,, 35 -	3·68	3·49	3·30	3·54	—	—	—	—	—
,, 25 -	3·67	3·76	3·33	3·62	3·57	3·56	3·66	3·63	4.32
,, 31 -	3·03	3·12	2·48	3·02	3·01	2·81	2.70	2·85	3·02
,, 34 -	2·61	2·87	2·57	2·82	2·87	2·72	2·71	2·82	2·92
,, 38 -	3·90	3·71	3·44	3·45	3·36	3·77	3·48	3·57	3·34

DOMESTIC ANIMALS IN THE UNITED STATES.

The results of the enumeration of the domestic animals in the United States, made in connection with the Census of 1900, have recently been published in Census Bulletin No. 156.

NUMBER OF DOMESTIC ANIMALS IN THE UNITED STATES, JUNE 1, 1900.

Cattle:	Calves under 1 year	15,595,245
	Steers, 1 year and under 2	7,023,731
	,, 2 years ,, 3	5,254,330
	,, 3 years and over	3,191,831
	Bulls, 1 year and over	1,329,572
	Heifers, 1 year and under 2	7,263,433
	Dairy cows, 2 years and over	18,112,707
	Other cows ,, ,,	11,667,909
	Total cattle	69,438,758
Sheep:	Lambs, under 1 year	21,719,939
	Ewes, 1 year and over	32,058,920
	Rams and wethers, 1 year and over	8,058,253
	Total sheep	61,837,112
Swine, total, all ages		64,694,222
Goats ,, ,,		1,949,605
Horses:	Colts, under 1 year	1,348,298
	Colts, 1 year and under 2 years	1,478,149
	2 years and over	18,390,441
	Total horses	21,216,888
Mules, total, all ages		3,445,029
Asses and burros, total, all ages		111,450

An attempt was also made in 1900 to ascertain the number of pure-bred horses, cattle, Angora goats, sheep, and swine; but the returns made were found, upon investigation, to be so imperfect that they have not been tabulated.

Three different schedules were employed for the collection of the data, the first relating to live stock on the farms, the second to stock on the unfenced public domain and on ranges, and the third to the animals in barns and enclosures other than farms. Particulars of this latter enumeration were published towards the end of 1900, and have already been reproduced in this *Journal.** These figures (apparently with some corrections) are, however, included in the foregoing table, which thus comprises all the domestic animals in the United States, wherever located.

Comparisons with preceding censuses are, in many cases, rendered difficult owing to the uncertainties in the classification of live stock in 1890. This applies more particularly to the age distribution of the animals, as it is not clear whether, in 1890, all or any of the animals born in the spring of the census year were included in the general report made on June 1 of that year. It cannot, therefore, be stated with any certainty, for instance, what has been the change in the relative positions of the beef and dairy industries in the United States during the past decade.

Cattle were reported on 4,730,920 farms and ranges, and in 801,817 other barns and inclosures. The total number of cattle reported on hand on June 1, 1900, was 69,438,758, of which 67,822,336, or 97·7 per cent., were on farms and ranges.

Comparisons with previous censuses are not possible, but calculations by the Census authorities, based upon estimates made for the omissions and uncertainties at earlier censuses, indicate that there has probably been a decrease of about 7 per cent. in the number of cattle in the United States during the past decade. This decrease in the total number of cattle has not been accompanied by a decrease in the number of dairy cows, and probably not in that of other cows or calves; but the rise in the relative and actual number of calves and cows has been accompanied by a decline in the so-called beef cattle—steers of two and three years old. This is attributed mainly to the fact that beef cattle are now marketed at an earlier age, on the average,

* Vol. VII., March, 1901, p. 508.

than ten years previously. There has been a gradual reduction in this age for many years past, and this was accentuated by the high prices in 1900.

Texas has more cattle within its borders than any other State: it reports 9,595,611 head. Of the other States, Iowa has 5,447,510; Kansas, 4,552,642; while Nebraska, Illinois, and Missouri have each over 3,000,000.

Five States have more than 1,000,000 dairy cows, New York heading the list with 1,537,921, and Iowa following with 1,479,676, the other three being Illinois, Wisconsin, and Pennsylvania. In number of "other cows," kept mainly for breeding purposes, Texas heads the list with 3,403,625; no other State has a million. Of calves, Texas reports 2,192,008, and Iowa 1,299,294. Steers under two years old are most numerous in Texas (965,602), Iowa (733,505), Kansas (562,944), Nebraska, Missouri, and Illinois. Thus Texas, as is shown by the foregoing figures for cows and calves, ranks first in the breeding of cattle.

The cattle raised in Texas are shipped in large numbers to other States for feeding or fattening, and consequently some States report more two and three year old steers than does Texas. Of steers over three years old, Kansas reports 434,899; Indian territory, 354,964; Texas, 345,976; and Oklahoma, 306,716; many of the steers in these other States having been bred in Texas. Of steers between two and three years old, Iowa has 606,636; Texas, 596,322; and Kansas, 534,206; while Missouri, Nebraska, and Illinois have over 300,000. The farmers of Iowa, as a rule, sell the greater portion of their steers between the ages of two and three years. Oklahoma and Indian territory farmers prepare large numbers of Texas steers, of three years and over, for market.

The total number of sheep in the United States was 61,837,112, of which 61,605,811 were on farms or ranges. In wool-bearing sheep—*i.e.*, those of one year old and over—there appears to have been a decline during the decade of between 2 and 3 per cent. There was a large decrease in Texas, where the growth in the number of farms has materially reduced the range land, and enhanced the value

of all land suitable for cultivation; so that many ranchmen have been unable to secure pasturage for their flocks at a reasonable rental. Throughout the older parts of the country, and in a less degree in the more newly-settled States, the small farmer has found it more profitable to keep dairy cows and other cattle than sheep; hence the decline in sheep husbandry in all farming sections. In the western States sheep raising is still a leading industry. There has been in that region a large increase during the decade, due in small part to a substitution of sheep for cattle, but more largely to additions to flocks kept on the public domain Seven States had over 3,000,000 sheep in 1900, viz., Montana (6,170,580), Wyoming, New Mexico, Ohio, Utah, Idaho, and Oregon.

The number of swine on farms and ranges is stated to have probably increased by about 10 per cent. during the decade. Nearly two-thirds of the swine are raised in the north-central States, Iowa ranking first with 9,851,929, or over 15 per cent. of the total in the United States. Illinois has 6,082,412, and other States with over 3,000,000 head are Missouri, Nebraska, Indiana, Kansas, and Ohio.

The following table shows the estimated value of the live stock on farms and ranges of the United States; no returns were collected concerning those in barns and enclosures other than farms. In 1890 the estimated value was £485,000,000, and in 1900 £626,000,000, or an increase of about £141,000,000. It is thought, however, that the increase is due rather to more careful enumeration than to actual additions to value.

ANIMALS ON FARMS AND RANGES, 1900.

Live Stock.	Total Number.	Total Value.	Value per Head. All Ages.
		£	£ s.
Cattle - - - -	67,822,336	307,604,000	4 11
Sheep - - - -	61,605,811	35,483,000	0 12
Swine - - - -	62,876,108	48,339,000	0 15
Goats - - - -	1,871,252	680,000	0 7
Horses - - - -	18,280,007	187,240,000	10 0
Mules - - - -	3,271,121	41,002,000	12 13
Asses and burros - -	95,603	1,213,000	12 14
		626,163,000	

CATTLE INSURANCE IN BAVARIA.

It has been found in Germany that neither local insurance associations nor private companies have been adequate to meet the requirements of owners of live stock. The former are too small, and the number of members is insufficient to bear the risk of any unusually heavy losses, while the latter are too expensive, and in Austria no private live stock assurance company has been able to maintain itself for any length of time. Constant supervision of the stock insured has been found to be a first requisite of success in Germany, in order to prevent unreasonable claims by careless owners; and to ensure this it is essential that the area should be limited in extent. Hence the necessity of small societies operating in a limited area was realised; but, in order to avoid the disadvantages of small independent groups, they have been affiliated to a central organisation in such a way that part of the risk is borne by the local society, and the remainder by the whole organisation. Such associations are now being recognised by, and receive assistance from, the Government or provincial administration of some German States and in Austria. Provision was first made for this form of live stock insurance in Baden by a law passed in 1890. Bavaria followed with similar legislation in 1896; and several provinces in Austria have imitated these German States, the first association to be established there being the Provincial Cattle Insurance Office for Lower Austria.*

Five years have now elapsed since the Bavarian Cattle Insurance Office commenced operations, and an account of its constitution, and of the results obtained during that period,

* *Wiener Landwirtschaftliche Zeitung*, 26th March, 1902.

has been contributed by H. Ehrlich to the *Deutsche Landwirtschaftliche Presse** from the official reports of the institution.

The Bavarian Cattle Insurance Office is based upon the principle of mutuality, and provides compensation for losses incurred by stockowners from the death or compulsory slaughter of their cattle and goats, and from the carcases of slaughtered cattle being subsequently condemned by the authorities as wholly or partially unfit for food owing to their being affected with some scheduled disease.

The Insurance Office is an association of all the local insurance societies which accept certain fundamental statutes applicable to all alike. The local societies are voluntary and mutual, and may be formed for a district comprising one or more parishes. The central office exercises a general supervision over the affiliated societies, and can impose fines up to 10s.

Upon the creation of the office, a capital sum was paid over to it by the Bavarian Treasury, to be administered as a special fund; the date when this is to be repaid is provided for in the Finance Act. In addition, the State makes a yearly allowance to the Insurance Office, which was at first £2,000, but which amounts at present to £5,000; and a supplementary allowance of £1,250 has for several years past been given towards assisting certain local societies which had suffered heavily. There is a reserve fund, into which are paid the interest on the capital and the entrance fees. The financial business of the Insurance Office is transacted by the Royal Fire Insurance Office, towards the expenses of which the Cattle Insurance Office annually contributes about ¼d. for every £5 insured. In 1900—01 the sum so paid was £675.

Any owner of cattle or goats can become a member of a local insurance society, but he must enter the whole of his stock for insurance, except animals under three months or over twelve years of age, sick or broken down animals, and certain other classes of stock, which are not accepted for insurance. The value of the animals insured is determined by a committee of three members of the society, who also

* 29th March, and 2nd April, 1902.

decide as to the general fitness of the animal for acceptance. In estimating the value of each beast, according to the values current in the district, regard is had to its age and condition at the time. Goats are valued at 15s. per head, irrespective of age, etc. The value of the stock as thus determined constitutes the amount insured, and the animals are then entered in the insurance record, with (in the case of cattle) particulars of the sex, age, colour, breed, purpose for which kept, and value. Any change in the stock insured must be immediately notified to the society. Entering young animals (when of proper age) is reckoned among such changes.

Three members of the committee of the society make a systematic survey in the winter and spring of every year, to ascertain that all the animals capable of being insured on a farm are duly insured, that all the insured animals are present, and that there has been no change in the value of the stock. Change of ownership of an animal among members of the society does not extinguish the insurance, all the rights and duties of which are transferred to the new owner. If an animal is sold to a non-member, however, the insurance lapses, except in the case of an animal dying from a scheduled disease or compulsorily slaughtered, within a certain specified period of time.

Members of these insurance societies must notify cases of sickness, accident, death, or compulsory slaughter of their animals, and the necessary steps are then taken by the society. In cases of severe sickness a veterinary surgeon may be called in, and the animal may be treated at the expense of the society, but the owner is required to render, free of charge, all the assistance necessary, and to carry out faithfully all the instructions of the veterinary surgeon. If a beast appears to be suffering from a disease which is incurable or can only be cured with difficulty, its immediate slaughter may be ordered by the society.

The value of the dead beast is estimated according to current prices, due regard being had to age, condition, and the purpose for which it was kept; no deduction being made for deterioration as a result of illness or injury. The total

amount must not exceed by more than ten per cent. the value of the animal inscribed in the insurance record.

The amount of compensation paid for animals which have died is seven-tenths of the value thus ascertained; in the case of animals compulsorily slaughtered it is eight-tenths; for goats it is always 15s. If the carcase of a slaughtered beast is condemned by the police authorities as wholly or in part unfit for food on account of some scheduled disease, the compensation paid is seven-tenths of such a sum as the carcase has lost in value owing to this condemnation.

The Central Office pays half the compensation, the other half being paid by the local society: in practice, the Central Office pays out the whole sum as soon as it is satisfied as to the claim, and collects the other half from the local society at the end of the year. In cases of infraction of the regulations, the right of withholding the compensation is of course reserved.

Provision is made for appeal by the stock-owner, in cases where he is dissatisfied with the value placed on his animals, or with other decisions of the society, to a tribunal, usually consisting of three members of the society, one nominated by himself, a second by the committee of the society, and a third co-opted by the first two.

The members of the societies pay an entrance fee and an annual premium. The entrance fee has hitherto been 2 pf. (about ¼d.) for every two shillings insured, but this amount is subject to variation in certain circumstances. The premiums are calculated annually according to the year's requirements for compensation (including cost of management), and levied accordingly. The amount is based upon the total value of the animals as ascertained in the spring and autumn surveys. These premiums amounted on the average to 1·11 per cent. of the total sum insured in 1896-7, and have somewhat increased since, so that in 1900-01 they were 1·32 per cent.

The growth of the operations of these Bavarian cattle insurance societies has been considerable during the five years 1896-7 to 1900-1. The number of local societies has increased from 814, with a membership of 39,201 owners of 194,402 animals, to 1,551, with 74,020 members owning

326,214 animals. The total number of cattle and goats in Bavaria is given as 3,630,088 at the end of 1900, so that the number insured represents 8·99 per cent of the whole. The total sum for which the animals were insured was £1,974,900 in 1896-7, and £3,402,000 in 1900-01. The losses of stock rose from 4,614 to 10,080 head (the total number in the five years being 38,254). The compensation paid has risen from £32,809 to £73,680, or £271,787 altogether in five years. Against the sum, however, there is to be set £88,900, or not quite a third of the amount, which represents the proceeds of the dead or slaughtered animals, so that the net amount paid by the insurance office was £182,900. It may be noted further that the annual losses rose from 2·37 to 3·09 per cent. of the number of animals insured.

THE POULTRY EXHIBITION AT MADRID.

Among the many countries from which the United Kingdom obtains supplies of poultry produce Spain occupies a very minor position. In the year 1900 less than ten millions of eggs were received from Spain, or only about one-half per cent. of the total foreign and colonial imports. In 1899 these were fifty per cent. greater, and the reason for such a decline has not been explained. Yet, we cannot doubt that for centuries poultry-keeping has been followed in the Peninsula, for we owe to that part of Europe breeds of of fowls which have been notable as egg producers. The Black Spanish, at one time popular by reason of its fecundity and the large size of its eggs, appears to have originated in Spain and found its way to this country by the Netherlands, probably when Belgium and Holland were appanages of the Spanish Crown. The Andalusian, formerly called the Blue Spanish, and the Minorca were imported direct from South-Western Europe into Britain. When the Andalusian was brought over we have no evidence, but the records show that the Minorca was introduced into Devon by trading ships about a hundred years ago, and its striking economic qualities, both as regards size and number of eggs produced, won for it the popularity it has attained. These three breeds probably have the same ancestry, the present variations being due to different ideals in breeding. Yet they are closely related, and each excels in egg production. Taking all the races of fowls at present known to us, no breed can equal them in weight of eggs which an individual hen will lay, for these eggs are amongst the largest we obtain. Considering these facts it is surprising that so little has been known respecting poultry-keeping in Spain, but it is generally

admitted that this branch of live stock occupies a small place in the agriculture of that country.

At one time throughout Spain a type of fowl was largely kept called the Castilian breed, and this seems to be the progenitor of our Spanish races. Medium in size of body and length of leg, tight in feather, entirely black or very dark in plumage, and having a large single comb, it was favoured by reason of the large eggs which it produced. From this brief description it will be seen that such a type may reasonably be regarded as the progenitor of the Black Spanish, the Minorca and the Andalusian, whose variations are secondary. Throughout Castile and Northern Spain, and in the Malaga district this class of fowl is still most evident. Where a different class of poultry is seen they follow largely the Game, due to frequent importations of fighting fowls from the United Kingdom for the purposes of the cockpit, a sport which it has been suggested was introduced during the Peninsula Wars, but this we should very much doubt. These remarks do not apply to the Cadiz and Barcelona districts. In the former, several decades ago, there was a large importation of Cochins, which have considerably modified the fowls of that province, and around Barcelona the French and cognate races have been introduced. But taking the country as a whole the poultry commonly met with have a distinct uniformity of type, and the great majority are black or very dark in plumage. Such variations as appear are not greater than might be looked for where so little has been attempted in selection or care in breeding.

Within late years more, however, has been done in this direction, and efforts are now being put forth to improve the fowls of the country, both on the part of the agricultural authorities and the Spanish Society of Poultry Breeders, to whose efforts the excellent Exhibition of Poultry held at Madrid in May was due. We must also note the fact that a few of the great landowners and others have introduced stock into the country, though the influence of these, however great in their own immediate districts, has not yet modified to any large extent the general fowls of the country. Probably it is too early to expect this result. The best flock of fowls of the

Castilian type which we saw was at the State Agricultural College at Manclou, a few miles from Madrid. These were, with one or two exceptions, entirely black in plumage, and built on what may be termed Minorca lines, except that they were much smaller in comb, and not so deep or round in body as are the English bred specimens. In fact, but that they were red in face and had smaller combs, they followed very nearly the shape of the English Black Spanish in build and frame. But whilst the Manclou fowls were, as a flock, the best we saw, the same class was seen in the several provinces visited, and the efforts of the Ministry of Agriculture and the Spanish Poultry Society are evidently, and wisely we think, to be put forward in dissemination and improvement of this class. To do so they are looking to secure stock from England, and this is another instance in which we have improved a breed to send it back to its native land with strengthened and highly developed qualities. Our breeders should, therefore, endeavour to take advantage of the opportunity offered; but we should strongly urge them not to export the huge combed specimens too often seen in our shows, but such birds as are less pronounced in this respect and close in plumage. On the banner and badges of the society named, the Minorca is shown as the model for Spanish breeders.

Reference has already been made to the introduction of foreign races, and in the Show several Spanish exhibitors were represented by other than the Spanish fowl noted above. Many of these had evidently been imported specially for the Show, and British varieties of poultry were largely in evidence. We were interested in seeing a fowl which is said to be specially suitable to the Barcelona district, where it is stated to be bred extensively. This is called the Prat fowl, but whether it yet deserves a distinctive name is open to question, as it is very uncertain in colour of plumage and evidently has not been selected with care. The size is much larger than the Castilian breed, it is heavier in bone and shorter in the leg. All the specimens in the Show had a buff tinge in the plumage, but one specimen was very nearly like a moderate Buff Orpington, having white legs and feet.

Another was speckled or splashed in plumage, but with dark legs. The hens varied very considerably. It is said that crosses between the Light Brahma and the Prat are popular, because this gives tinted shelled eggs and large bodied birds. Such a breed and cross indicates a desire for better table poultry than will be produced by the Castilian fowls. At the present time table fowls are very poor indeed in Spain, and we did not see a chicken in the markets of Madrid or the hotels which was worth killing. Small in size, carrying a very small amount of meat, which was dry and tasteless, they compare very unfavourably with the ordinary lean fowls seen in our country markets. But it is open to doubt whether central Spain is likely ever to produce fowls at all equal to the best specimens of English, French, or Belgian.

The Exhibition was the second of the great International gatherings resolved upon at St. Petersburg in 1899, to be held at intervals of three years. It was held under most distinguished auspices. His Majesty King Alphonso XIII. and the Queen Maria Christina accorded their patronage and support; the Ministries of Agriculture and of War were active in their efforts to promote its success; the Duc de Sesto was Honorary President; Don Salvador Castello was Director-General, and the Count de las Navas, Librarian in the Royal Palace at Madrid, acted as Sub-Director General. His Excellency Senor Jose Canalejas, Minister of Agriculture, was indefatigable in his efforts, and entertained the foreign delegates at Manclou, afterwards conducting them round the State farm. The Belgian, French and German Governments were officially represented, but the number of delegates was not so large as at St. Petersburg. The Exhibition was opened on May 3rd by their Majesties the Queen Regent and the young King, accompanied by several members of the Royal Family.

The Show was held in the Jardins des Buen Retiro, and was beautifully arranged on the usual Continental lines. Nearly a thousand pens of birds were staged, of which more than half were sent by Belgian and French exhibitors, who had responded most heartily to the invitation of the

authorities. Only one English breeder, the Hon. Florence Amherst, sent specimens from this country, which, however, gained several prizes. But British breeds and British bred birds were very strongly in evidence, even though not shown by our breeders. This is regrettable, though it is capable of explanation. Many of the Continental exhibitors are dealers rather than breeders, and they were thus able to send a large team, and in several cases accompany their birds, doubtless securing their reward by the sales made at the Show and the connection secured. The chief reason, however, was that a special commissioner was appointed from these countries to attend to the fowls *en route*, and to secure their passing the frontier expeditiously. Special catalogues were issued of the Belgian and French exhibits respectively, giving brief descriptions of the breeds found in those countries, and there is little doubt that this enterprise will prove of great benefit to the breeders therein. Taking the Show as a whole, the quality of the stock displayed was very good indeed, and it cannot fail to greatly stimulate poultry culture in Spain, especially as the majority of the exhibits, at any rate in the larger breeds, have remained in the country. The dead poultry from France and Belgium were very fine indeed.

EDWARD BROWN.

AGRICULTURAL AND MISCELLANEOUS NOTES.

Experiments with Barley in Yorkshire.

When barley follows roots fed on the land by sheep, there is sometimes a tendency, in a moist season, towards the production of rank, weak straw, with the result that before harvest the crop becomes laid, the clover and grass seeds sown along with the barley being also damaged. Many farmers have been in the habit of applying salt, previous to sowing barley, with the object of producing a stouter straw and therefore a better standing crop. Where barley is taken as a second corn crop this treatment is not generally considered necessary.

A test was accordingly made at Garforth on a medium loam where half the crop of roots was fed on the land, one plot receiving 5 cwts. of agricultural salt per acre previous to the land being worked before the barley was drilled. 50¼ bushels and 38 cwts. of straw per acre were harvested from the plot which received salt, as compared with 43¼ bushels and 29¼ cwts. of straw from the other plot; the salt having thus produced an increase of 7 bushels of grain and 8¾ cwts. of straw per acre. But the season was exceptionally dry, and so the particular object aimed at in the experiment has not been attained, and it will be repeated with a view to testing its advantage in a wet season. The better crop in 1901 may be accounted for to a great extent through the salt helping to retain the moisture. It was noticed that there was a smaller proportion of weeds on the plot receiving salt, and the clover and grass also suffered to some extent, so that the salt should be applied some time previous to sowing.

An experiment was also made to determine whether a better sample of barley is obtained by thick or thin seeding. By

sowing barley on two plots at the rate of 3 and 5 bushels to the acre, a crop larger by 3 bushels of grain and 2½ cwts. of straw per acre was obtained from the thinner seeding; while so far as the appearance of the samples goes, their quality was practically the same. This test will be repeated.

In certain parts of Yorkshire the following rotation is in general use: (1) roots; (2) barley or oats; (3) clover; (4) wheat; (5) barley. In the fifth year it is sometimes considered necessary to broadcast and work into the land, previous to drilling the barley, a quantity of artificial manure. In 1900 and 1901 experiments were undertaken at two centres to test this, as well as to ascertain whether this practice had any influence on the quality of the barley for malting purposes. The manures employed were: (1) 1 cwt. sulphate of ammonia; (2) 1 cwt. sulphate of ammonia and 2 cwts. superphosphate; (3) 1 cwt. sulphate of ammonia, 2 cwts. superphosphate, and 2 cwts. kainit; and (4) a quantity of Damaraland guano equal in money value to the last; control plots being also left without manure. It was concluded that, when barley is grown as a second corn crop, and when yield of grain and straw and malting properties are considered, the experiments point to a complete mixture of artificials as being the most profitable; also that a suitable proportion is about 1 cwt. sulphate of ammonia, 2 cwts. superphosphate, and 2 cwts. kainit.

[*Yorkshire College, No. 22, Report on Experiments with Barley, 1901.*]

MAIZE-GROWING EXPERIMENTS.

Some experiments in the cultivation of maize were carried out last year at the South-Eastern Agricultural College, Wye.

Six varieties of seed were sown which came from the Central Experimental Farm, Ottawa, and for purposes of comparison a seventh, grown in the neighbourhood and commercially known as "red cob," was obtained from a local seedsman. About four acres of land were set aside for the experiment, the soil being a chalk loam of a fair depth,

and in moderate condition as regards fertility. The land was ploughed in the autumn, ploughed again and cultivated in the spring, and the seed drilled on May 29th.

On one half of each plot the rows were placed one foot apart, and on the other half two feet apart, two bushels of seed being used per acre in the former and one in the latter case. The after-cultivation consisted of hand and horse hoeing, the latter operation being performed several times.

The crop, with the exception of a small strip of land running through the centre of each plot, was manured as follows per acre :—12 loads of dung (ploughed in), 3 cwt. of superphosphate applied at the time the crop was sown, and $1\frac{1}{2}$ cwt. of nitrate of soda put on after it was up.

The seed germinated slowly and unevenly, and the crop was greatly interfered with by rooks and rats, which attacked it persistently until the corn was nearly a foot high, so that in places a very indifferent plant was obtained. Until about the middle of July the maize made but slow progress, but after that date it grew rapidly, and on August 27th the earliest plots were judged fit to be cut, and from that time onwards, until it was finished, portions of it were cut daily according to the requirements of the animals upon the farm.

The yield per acre of the "red cob" amounted to 21 tons of green food, while the six varieties obtained from Canada yielded from 13 tons to 22 tons per acre.

The different species varied considerably in germinating capacity, habit of growth and date of coming into ear. The manures had a marked effect upon all the varieties, and their application was well repaid in the increased yield.

As regards thick and thin seeding, the thinly seeded plots yielded slightly lighter crops in each case than the closer sown, but the plants developed more satisfactorily than in the latter, and it is probable that in feeding value the thinner seeded plots had the advantage. This result is fully in accord with American experience, namely, that the best results were obtained by wide seeding, opportunity thus being offered for the admission of light and air, and for intertillage. The Wye experiments also confirmed the experience of

growers in America, that the most profitable time for cutting the maize, either for green food or for ensilage, is after the cob has formed and when the grain has arrived at the "cheesy" stage, the plant having then attained its maximum feeding value, and if properly grown the stem has not had time to become woody nor the leaves withered.

The maize grown in the Wye experiments was used chiefly as green feed for dairy cows and farm horses ; the cows milked well on it and produced excellent butter.

Before feeding to the stock, the maize was passed through a chaff cutter, as it was found that the animals cleared it up rather better when cut short, and that the diminution in waste more than repaid the additional labour. In order to test its value for silage purposes, some small silos were filled with chopped maize. When opened, the silage was found well preserved, and was much appreciated by the cows. It had a slightly acid smell which soon disappeared, and there was little waste.

HYDROCYANIC ACID GAS FOR CURRANT BUD MITE.

The results of the experiments, carried out in 1900 and 1901 under the direction of the South Eastern Agricultural College, Wye, in the fumigation of currant bushes for the destruction of bud mites, have shown that while this treatment will in most cases diminish the attack by destroying a great many of the mites, it has apparently no effect upon the eggs, and will not entirely get rid of the pest. In certain of these experiments the strength of the fumigant was increased and the fumigations were repeated, but it is held to be doubtful whether any alteration in the amounts of the chemicals used, or in the length of time during which the bushes are under treatment, would be able to effect a permanent cure.

BULLOCK FEEDING EXPERIMENT.

An experiment was carried out in 1900–01 by the Midland Agricultural and Dairy Institute with the object of comparing the feeding value of undecorticated cotton cake,

linseed and cotton cake mixed, and linseed decorticated cotton meal and maize meal mixed.

Nine bullocks under two years old were chosen and divided into three lots of three each. From December 12th to December 27th they all received the same daily ration, viz. 5 lbs. undecorticated cotton-cake, 56 lbs. swedes, with hay, barley straw, and chaff, *ad lib.* The experiment proper commenced on the 28th December, each bullock receiving the same amount of roots, hay, and straw; but Lot A had in addition 3 lbs. undecorticated cotton cake and 3 lbs. linseed cake, lot B had 1 lbs. linseed cake, 1½ lbs. decorticated cotton meal, and 3 lbs. maize meal, while lot C got 6 lbs. undecorticated cotton cake. The quantity of all these artificials was increased by a third on January 25th, and again by the same amount on February 22nd. On April 8th, 15th, and 22nd, one bullock was chosen from each lot, the live weight recorded, and the carcase weight taken three days after. The bullocks were sold at 7s. 6d. per stone, and their value per head worked out as follows: Lot A, £17 0s. 10d.; Lot B, £17 2s. 6d.; Lot C, £16 12s. 2d. The daily gain had been 2·18, 2·10, and 1·73 lbs. per head respectively; while Lot C showed a somewhat higher percentage of carcase. The cost of the food was, however, lowest in the case of Lot C, and subtracting the original value of the bullocks on December 12th, and the cost of the food from the final value on April 15th (average of the dates when they were killed) there was shown a net profit per head of 3s. 5d. in the case of A, 7s. 7d. in the case of Lot B, and 5s. 11d. in the case of Lot C. The butcher's report was that Lot A were good cutters and nice quality; Lot B were first class, full of quality, and the meat was extra; Lot C was a little short of meat, and required more help.

The conclusion drawn from this experiment was that the profit from such winter feeding is very small, as after debiting rent and labour, and crediting value of manure, the receipts and expenditure nearly balance; and the difference in the profits obtained is not great enough to warrant any distinct inference being drawn.

MANURING OF POTATOES.

Experiments in the manuring of potatoes have been carried out at the Yorkshire College, Leeds, under the direction of Professor R. S. Seton, in 1900 and 1901, in continuation of those undertaken in 1899, and already described.* As the season may affect the action of manures it is hoped that the trials may be continued for a number of years. In this connection it should be noted that the following results, which represent the averages of the three years 1899-1901, were obtained in a succession of three dry seasons.

The trials have been conducted at several centres, in addition to the college farm at Garforth. They had as their objects, (*a*) the illustration of the comparative effects of a heavy dressing of dung, and of a moderate dressing of dung supplemented by a complete mixture of artificials; (*b*) the determination of the kinds and quantities of artificials that may be best employed along with a moderate dressing of dung; and (*c*) to ascertain whether it is necessary to use a complete mixture of artificials when no dung is employed.

In discussing the results, the potatoes have been valued at £2 10s. per ton, for the past season this value is too high, but in most years it probably approximates to the average value to the farmer. The dung is valued at 5s. per ton, but only half that sum has been charged to the potato crop, the remainder falling to be charged to the succeeding crops in the rotation. The entire cost of the artificials is charged against the potatoes.

The following table shows the comparison between heavy and moderate dressings of dung, and a moderate dressing of dung with artificials.

Although 10 tons of dung is a small allowance for potatoes, it is in many cases as much as can be spared. The following table shows that the addition of a further 10 tons gave a better yield than the addition of 6½ cwts. of mixed artificials; also that the superiority was still more accentuated when the profits were considered, since the entire cost of the artificials

* Journal of the Board of Agriculture, Vol. VII. pp. 24, 438.

is charged against the increase on Plot 7. It will be noticed that in 1900 the moderate dressing of dung gave quite as good results as the more liberal allowance.

	Plots 1 and 14.		Plot 2.		Plot 3.		Plot 7.	
—	No manure.		20 tons dung.		10 tons dung.		10 tons dung $1\frac{1}{2}$ cwt. sulph. amm. 3 ,, super. 2 ,, sulph. pot.	
	Tons	Cwts.	Tons	Cwts.	T'ns	C'ts.	Tons	Cwts.
Average crop in 1899 -	6	$7\frac{3}{4}$	10	$10\frac{3}{4}$	8	19	9	$18\frac{1}{2}$
,, ,, ,, 1900 -	6	$4\frac{1}{2}$	8	11	8	$13\frac{1}{2}$	8	$15\frac{3}{4}$
,, ,, ,, 1901 -	6	$11\frac{1}{4}$	10	$7\frac{3}{4}$	9	8	10	$3\frac{1}{2}$
Average of the 3 years -	6	$7\frac{3}{4}$	9	$16\frac{1}{2}$	9	$0\frac{1}{4}$	9	$12\frac{1}{2}$
Average increase over the unmanured plot - -	—		3	$8\frac{3}{4}$	2	$12\frac{1}{2}$	3	$4\frac{3}{4}$
Average estimated profit for the 3 years - -	—		£ s. d. 6 1 11		£ s. d. 5 6 3		£ s. d. 4 8 7	

Examining the question whether one of the constituents may be omitted from the artificials given in addition to 10 tons of dung, the three years' experience indicated that it was only where potash was absent that the yield and profits were prejudicially affected.

On other plots the effect of doubling one of the constituents in the $6\frac{1}{2}$ cwts. of a complete artificial dressing (in addition to 10 tons of dung) was tried. In each case an average increase of $8\frac{1}{2}$ to 10 cwts. of tubers was obtained at a cost of 8s. to 23s., but the superphosphate being the cheapest, the greatest profit resulted from supplying a double allowance of this manure.

[*Yorkshire College, Leeds, and East and West Ridings joint Agricultural Council, No* 23.]

MASH AS A FOOD FOR POULTRY.

Mr. A. G. Gilbert, poultry manager to the Canadian Experimental Farms, states in his Annual Report for 1901, that the experience of the poultry department, after many years' trials, points to the conclusion that the "mash," as part of the daily ration of poultry, is beneficial when judiciously used. When

fed in too great quantity to one and two year old hens, it is apt to create an over-fat condition. In the case of the latter, if of the heavy breeds, the over-fat condition is likely to be fatal. If fed in too great quantity as a morning ration, it is likely to make the hens disinclined for exercise. It is a valuable aid to moulting hens, and is a convenient form of utilising much of the farm and farm-house waste. Where hens have had a comparatively free run, its beneficial effect in egg production has been noticeable.

EXPERIMENTS IN THE PRESERVATION OF EGGS.

Further experiments in the preservation of eggs, in continuation of those described in the last December number of this *Journal* (p. 356), have been carried out by Mr. F. T. Shutt, Chemist to the Experimental Farms of the Canadian Ministry of Agriculture. These additional trials extended over a period of seven months, from May 14th to December 14th, 1901.

In the course of these trials experiments were made in the preservative power of (1) lime-water, (2) lime-water containing one per cent. of common salt, (3) lime-water containing two per cent. of common salt, (4) a one per cent. solution of common salt, and (5) a two per cent. solution of common salt. The efficacy of the following methods was also tested: (6) smearing the eggs with vaseline, and then either (*a*) immersing in lime-water or (*b*) setting away in a rack; (7) covering with paraffin and immersing in lime-water; (8) dipping in a saturated solution of potassium permanganate, and then setting away in a rack; and (9) dipping in a five per cent. solution of sodium aluminate.

The preservative solutions which gave the best results were lime-water and the lime-water containing one per cent. of salt. There was not much difference between the eggs, cooked or uncooked, as regards appearance, smell or taste, kept in these two solutions; but such as there was showed the eggs in the latter to be slightly better.

The addition of salt to the lime-water to an extent exceed-

ing one per cent. would appear to be of no advantage ; indeed, when the salt present amounted to two per cent., it was noticed that the quality of the preserved eggs had suffered. The one per cent. solution is prepared by dissolving $1\frac{1}{3}$ oz. of common salt in each gallon of the saturated lime-water.

The vaseline-covered eggs were not quite as well preserved as those simply immersed in a solution of lime-water ; and all the other methods tried were decidedly inferior.

The general conclusions from the experiments made in 1901 tend to confirm the view that lime-water is a most effective preservative, and to indicate that the addition of not more than one per cent. of common salt is an advantage. Lime-water has the further recommendation of being cheap, easily prepared, and pleasant to handle.

At the Rhode Island Agricultural Experiment Station experiments were carried out last year in the preservation of eggs with the following substances : viz., water glass, dry table salt, lime water and salt brine, vaseline, ashes, gypsum, powdered sulphur, powdered sulphur and sulphur fumes, permanganate of potash, salicylic acid and salt brine. Of the various methods tested, the old way of using slaked lime and salt brine was found to be very effective and inexpensive. For short periods of a few weeks, smearing eggs with vaseline or with any other clean greasy substance was an effective preservative, while for a period of a few months packing in dry salt was successful. Of all the substances experimented with, however, a water glass solution proved to be the most useful. It is easily manipulated, and the solution can be repeatedly used. The eggs should be completely immersed in the solution, and, if any eggs float, an inner cover which will sink them below the surface of the liquid should be used. In several tests where eggs were placed in stone jars, inverted saucers were used for this purpose. It was found that the strength of the water glass solution could be reduced to as low as 3 per cent., and it still retained a complete preservative power over eggs after an interval of ten or eleven months.

POTATO PLANTING EXPERIMENTS.

For six years past experiments have been conducted in Canada to determine the best distance at which to plant potatoes. The rows were in all cases $2\frac{1}{2}$ feet apart, and the best results were yielded on the average by planting the sets 14 inches apart, although the results from planting 12 inches apart were nearly the same. Further trials in planting sets with at least three eyes each at different depths in rows $2\frac{1}{2}$ feet apart, and 12 inches apart in the rows, showed that the best results were obtained from planting the sets only 1 inch deep. Level cultivation was adopted, and thus very little soil was thrown on the potatoes after they were covered at the time of planting.

Other experiments, which have now lasted four years, in planting potatoes at different dates showed that the best results were obtained from the earliest plantings (end of May). Practically nothing was obtained from potatoes planted after the middle of July.

[*Report on Experimental Farms, Canada, 1901.*]

EXPERIMENTS WITH BEES.

Various experiments have been conducted with bees in Canada with reference to the most suitable sizes of comb-foundations in sections. The trials were made with full sheets, half sheets, quarter sheets, sheets two inches and one inch square, and with no foundation; there being in each hive four sections. The full sheets gave the best results, the sections being less finished according as they were smaller, while the bees did not start to work in any section where there was no starter. Similar trials were also undertaken with brood foundations, viz., full sheets, half sheets, and two-inch strips. Here again the full sheets were in every instance the best.

Experiments were also undertaken to ascertain whether bees would injure sound fruit, this question having given rise to a good deal of controversy in Canada. The fruit consisted of peaches, pears, plums, and grapes, all perfectly sound,

placed, some in the hives, and some at different distances from them, on September 7th, when there was no surplus honey to be gathered on plants outside. Some of the fruit was dipped in honey, the skin of some was punctured in several places with a penknife, while the remainder was not touched. Four colonies were selected, of about equal strength, but in two of the hives all the honey had been removed, while five frames were left in the two others. At the end of a week, the honey had all been removed from the dipped fruit, which remained quite sound, and the bees had also sucked the juice through the punctures in the second lot of fruit so long as any liquid could be obtained ; the sound fruit was still uninjured, although the surface was polished and shining as if the bees had been travelling over it trying to find some opening through the skin. The experiment was repeated for three weeks, with the same results, at the end of which time the bees in the hives originally deprived of all honey were very sluggish, and there were many dead. These colonies had lived for three weeks on the punctured fruit and the honey, but appeared to be unable to pierce the skin of the sound fruit.

[*Report on Experimental Farms, Canada, 1901.*]

MAIZE ENSILAGE.

There are two methods of preserving maize for winter feeding in common use in Canada—by curing in shocks or stooks and by ensiling. Both methods inevitably lead to some loss of fodder, due to the destruction by fermentation of a portion of the carbo-hydrates and protein compounds. Experiments made in the United States have shown that the losses by field curing (in stooks) as a rule exceed those in the silo, at least with fairly mature corn. It has also been shown that the dry matter of stooked maize and silage is practically equally digestible, but succulency and palatability are more highly developed by ensilage.

Investigations have been carried out at the Central

Experimental Farm, Ottawa, to ascertain the extent to which the feeding value of the maize suffered by ensiling. Samples from the bottom, middle, and top of a silo 30 feet high were analysed and the results compared with the analyses of maize before being put into the silo. Although the data do not enable the total loss to be calculated, the following results were obtained :—

As regards dry matter, there was a close accordance between the percentages in the corn as first put in and in the silage taken from the floor of the silo, but at 2½ feet from the bottom, and in the middle of the silo, the dry matter exceeded by five per cent. or more that of the corn when put in. It would appear that there was considerable loss by leakage owing to the unavoidably immature condition of the maize. At the top of the silo, on the other hand, the moisture had increased by 4 per cent., this being presumably due to the combustion by fermentation of the dry matter, in which the nutrients (starch, sugar, etc.) suffered most.

The effect of ensiling upon the nitrogenous compounds was marked, the albuminoids, or flesh formers, being largely reduced to the less nutritive form, amides. This was most marked in the middle of the silo. There was always some loss of nitrogen, which was least in the middle of the silo.

In considering these deductions, it should be borne in mind that the maize put into the silo was less mature than usual, owing to the unfavourable season; and the larger proportion of water no doubt accounts in great measure for the extent of the deterioration. It has been well established that mature maize, that is, corn that has reached the glazing condition, yields ensilage of a greater feeding value than if less mature, and the destructive changes noted are largely accelerated by the great percentage of moisture in immature corn.

[*Report on Experimental Farms, Canada*, 1901.]

PIG FEEDING EXPERIMENTS.

The Wisconsin Agricultural Experiment Station has recently published details of experiments conducted by Prof. Henry with regard to the relative merits of maize as food for pigs when fed whole or in form of meal.

The trials commenced in 1896, and were continued in each year up to 1901. The general results obtained showed that in seven cases there was a saving of from 6 to 17 per cent. in the weight of food through grinding the maize to meal, while in two cases there was a loss of 2 per cent. and 9 per cent. respectively.

The experiment for 1901 commenced in the previous November, and continued for twelve weeks. It was found that to produce 100 lbs. of gain in live weight, 588 lbs. of shelled maize and wheat middlings were required, compared with 553 lbs. of maize meal and wheat middlings. There was therefore a saving by grinding amounting to 35 lbs. on 588 lbs., *i.e.*, 6 per cent. No allowance was made for the cost of grinding, the experiment being based entirely upon the gain or loss incurred while feeding.

Another series of experiments conducted at this station relates to the feeding value of rape, and the results obtained lead to the following conclusions :—

An acre of rape, when properly grown, and combined with a ration of maize and shorts, has a feeding value equivalent to 2,436 lbs. of a mixture of these grain feeds when it is fed to pigs of various breeds from four to ten months old.

Rape is a better green feed for growing pigs than good clover pasture. Pigs fed on the rape made on the average 100 lbs. of gain on 33·5 lbs. less grain than was required by pigs fed upon clover pasture.

Pigs are more thrifty, they have better appetites, and make correspondingly greater gains, when supplied with rape pasture in conjunction with their grain feed, than when fed on grain alone.

Rape by itself is not a satisfactory food, though it has been found that pigs will just about maintain themselves without loss of weight on rape alone.

GREEN MANURING.

In the spring of 1900, six plots on the Central Experimental Farm at Ottawa were sown with corn—two with wheat, two with barley, and two with oats. One plot in each case had common red clover sown with the grain at the rate of 12 lbs. per acre. After the grain was harvested in 1900, the clover was allowed to grow until the following season, and was ploughed in about the middle of May, by which time it had made a very heavy growth. Maize was sown soon after and cut in September. It was then found that the maize on the clover plots was taller and more leafy than on the others, while the weight of green fodder on the clover plots varied from $25\frac{4}{5}$ metric tons to $27\frac{7}{8}$ tons, that on the others from $15\frac{4}{5}$ to a little over 20 tons; the average difference in favour of the green manured plot being $8\frac{1}{2}$ metric tons per acre.

Similar trials were carried out at the same time with potatoes, the previous operations being exactly the same as in the first experiment. In this case the yield of potatoes on the clover crop varied from 411 to 440 bushels, as compared with 381 to 397 bushels on the others, the average increase being about 33 bushels, or 8 per cent.

[*Report on perimental Farms, Canada, 1901.*]

GERMAN EXPERIMENTS IN KEEPING POTATOES OVER WINTER.

This work was carried out during the winters 1899-1900 and 1900-1901, and it is reported on by Dr. Otto Appel.* Little that is not familiar to our more intelligent potato growers has been discovered, but a short summary of results may be given :—

The clamps or pits should be placed on fresh ground each year. In this way infection of the tubers with decay-inducing germs is, to some extent, avoided.

Heavy soil as a covering keeps out frost better than light soil.

* Arb. aus der Biol. Abth. für Land u. Forstwirtschaft am Kais. Gesundheitsamte, 1902.

The situation should be naturally dry, and ample facilities should be provided for running off the water.

Shelter supplied by a hedge, wood, or building had considerable influence on the frost.

The potatoes should be as dry and clean as possible at the time of storage. All diseased and damaged tubers should at that time be removed.

The clamps should not be too small. The temperature of large clamps was always higher than that of small ones, so that they suffered less from frost. The best results were got in clamps having a breadth of 4 to 5 feet, and a height of about 3 feet. The length must be regulated by circumstances.

Straw supplemented by soil was found to be the best covering material. The straw should be strong, so as not to collapse too much under the load of earth, and the straw covering should not be less than 4 inches, and need not be more than 6 inches in thickness. It should be thoroughly dry, so that it may attract superfluous moisture from the mass of the tubers. The covering of soil, 20 inches, recommended for German conditions appears to be much beyond English requirements.

Potato haulm, as it often holds spores, is not suitable for immediate contact with the potatoes. It may, however, be used as supplementary covering, in which case the clamp would consist of a layer of straw, then 3 or 4 inches of earth, then 3 or 4 inches of haulm, and finally an equal thickness of earth.

Loose haulm, or rough fold manure, on the outside of the clamp, is not recommended on account of its catching and retaining rain.

Good ventilation is essential. This may be secured by leaving the ridge without soil, by placing pipes, wisps of straw, etc., at intervals along the ridge, and in other ways. The method of ventilation, however, that was found to give the best results was arranged thus:—The potatoes in the clamp were covered with about half their full allowance of straw, and a spadeful of earth was thrown on here and there to keep the straw in position. A scaffolding pole, 3 to 4 inches in diameter, was then laid along the ridge, and

clamp and pole were then covered with about 3 or 4 inches of straw. The whole clamp, ridge included, was then covered with soil and beaten smooth. The pole was then withdrawn, so that an air-space was left along the whole length of the ridge. Later on the open ends of this air-shaft, or ventilator, may be closed in such a way as to exclude frost.

MILK CHURNS AS MEASURES.

The Board of Agriculture consider it desirable to publish the following correspondence between their Department and the Central Association of Dairy Farmers with regard to the stamping of railway milk churns for the purposes of the Weights and Measures Acts :—

I.

From Honorary Secretary, Central Association of Dairy Farmers, to Secretary, Board of Agriculture.

Bank Passage, Stafford,
April 7th, 1902.

Dear Sir,

I beg to enclose copy of a resolution passed by this Association at a recent meeting, and to express the hope that it may receive your favourable consideration.

I am, etc.,

EDWIN SMITHELLS.

Enclosure.

Resolution passed at the annual meeting held at Birmingham on March 6th, 1902 :—

"That, in view of the occasional prosecution of a farmer for using a railway milk churn which is not officially stamped and which is not correctly gauged, the Association is of opinion that railway milk churns should be exempt from the regulations imposed by the Weights and Measures Act. This Association is convinced that, subject as these churns are to the exceedingly rough usage by the railway companies, it is impossible for them to remain accurate measures.

Only a small proportion of the churns in use are stamped with the stamp of verification; most authorities recognise the unreasonableness of enforcing the Act in regard to them, but until some alteration is made in the law farmers will always be liable to vexatious prosecutions under the Act.

"This Association, therefore, requests that the Board of Agriculture will give the matter its most careful consideration, with a view to place the farmers in a more satisfactory position with regard to it, while in no way prejudicially affecting the interests of the general public."

II.

From Secretary, Board of Agriculture, to Hon. Secretary, Central Association of Dairy Farmers.

May 2nd, 1902.

Sir,

I am directed by the Board of Agriculture to advert to your letter of the 7th ult., and to say that they have had under their consideration the resolution passed by your Association on March 6th. The Board concur in the view of your Association as to the unsuitability of milk churns as measures, but they desire me to point out that in cases where churns are so used the provisions of the Weights and Measures Acts must obviously apply.

The difficulty referred to in the resolution might, however, be met by invoicing milk conveyed in railway churns by "measured weight," and deducting the tare for the churn; and I am to inquire whether your Association could not take some steps to bring the advantages of this system to the notice of the milk trade generally.

I am, etc.,

T. H. ELLIOTT.

RAILWAY RATES ON AGRICULTURAL PRODUCE.

The Board of Agriculture think it desirable to give publicity to the following correspondence which has taken place between them and the Lincolnshire Chamber of

Agriculture with regard to the carriage of agricultural produce by rail.

Resolution passed by the Lincolnshire Chamber of Agriculture on 4th April, 1902 :—

Resolved unanimously: "That this Chamber considers that a special inquiry should be made by the Board of Agriculture on the question of railway rates for all agricultural produce, with a view to put them on a more equitable basis compared with the rates charged on foreign produce."

From Assistant Secretary, Board of Agriculture, to Secretary, Lincolnshire Chamber of Commerce.

"19th April, 1902.

"Sir,—I am directed by the Board of Agriculture to advert to your letter of the 7th inst., and to inform you that a copy of the resolution relating to railway rates referred to therein has been sent to the Board of Trade.

"I am at the same time to state that, although it would not be practicable for the Board to undertake any general inquiry of the character suggested by the Lincolnshire Chamber of Agriculture, they would be happy to investigate, and bring under the notice of the Board of Trade, any specific complaint made in cases in which it was alleged either that 'unfair or unreasonable rates' were charged, or that 'preferential treatment' was given."

I am, etc.,

W. SOMERVILLE.

CONVEYANCE OF DOGS BY RAIL.

The following is a copy of a Circular issued on May 3rd, 1902, by the Board of Agriculture to Secretaries of Railway Companies in Great Britain with regard to alleged unsatisfactory provision for the conveyance of dogs by railway :—

"SIR,—I am directed by the Board of Agriculture to acquaint you that they have from time to time received many complaints with regard to the unsatisfactory nature of the accommodation provided at railway stations and in railway carriages or luggage vans in connection with the conveyance

of dogs, and it has been stated that not only are dogs subjected to cruelty and unnecessary suffering owing to the want of pen accommodation set apart for dogs at railway stations and the ill-ventilated and badly lighted condition of the boxes or kennels provided in railway carriages and vans, but further that distemper and other contagious diseases are spread amongst dogs by reason of the failure to cleanse and disinfect the pens and kennels with efficiency.

"The Board think that such evils as may exist might be corrected by the voluntary action of the Railway Companies themselves rather than by action on the part of either Parliament or of the Board, and they would therefore be glad if the matter might receive the consideration of your Company, with a view to the improvement of accommodation and facilities provided for the purpose in question and the avoidance of complaints such as those which have been made.

"I am, Sir, your obedient servant,

"T. H. ELLIOTT, Secretary."

SALE OF BUTTER REGULATIONS, 1902.

The Board of Agriculture, in exercise of the powers conferred on them by section 4 of the Sale of Food and Drugs Act, 1899, made, on the 22nd of April, 1902, the following regulations with regard to water in butter :—

"Where the proportion of water in a sample of butter exceeds 16 per cent. it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the butter is not genuine by reason of the excessive amount of water therein."

These regulations, which extend to Great Britain, came into operation on the 5th of May, 1902.

"CANKER" ON WILLOWS.

Specimens of diseased willows forwarded to the Board from Lincolnshire were found upon examination to be affected by a "canker" caused by the fungus *Melampsora Alii-fragilis* (Kleb.).

This fungus lives on two different plants at different periods of its growth. It first occurs in an inconspicuous form on various kinds of wild garlic or wild onion, *Allium ursinum*, L., *Allium Schœnoprasum*, L., etc. From the garlic it passes on to the willow.

The only certain means of exterminating the fungus is to eradicate from the neighbourhood one of the two plants on which it grows, so that to prevent injury to willows, the wild garlic or onion must be got rid of. If this is done thoroughly the fungus will cease to exist; but half measures would only mean waste of time and money.

WIREWORMS, MILLIPEDES, AND ANTS IN GARDENS.

Wireworms and millipedes (*Julidæ*) are prominent garden pests, which can only be treated in two ways, viz., by fumigation and by trapping.

Fumigation for subterranean insects and other animal pests is best carried out by means of bisulphide of carbon. This is used as follows: Make small holes in the flower bed or border, two yards apart, pour in ½ oz. of the bisulphide of carbon, and close up each hole as the carbon is poured in. The liquid should be put in between the plants, so that it should not reach the roots.

Where ants are troublesome and causing damage a similar remedy may be adopted for their extermination.

First find the ants' nests; these may be under the ground, under dome-shaped masses of earth, etc., above the ground, or under stones and rotting wood, according to the species of ant concerned. When they are underground they can only be traced by following the ants, and so finding the opening in the soil by which they descend. Having located the nests, make a hole in each with a crow-bar, about 8 inches in depth, and pour into each hole from 1 to 2 ozs. of bisulphide of carbon, according to the size of the nest, and fill up the holes at once with earth. If the ground is regularly undermined with ants' nests and tunnels, holes should be made about 3 feet apart, and 2 ozs. of the bisulphide of carbon poured into

each; though this is not as a rule necessary. The best time to attack the ants is in the evening.

Care must be taken not to put a light near the bisulphide of carbon, or to let it come in contact with hot metal, as it is highly inflammable. It must also be remembered that the fumes from the liquid are poisonous.

Trapping, largely employed for wireworms, consists in placing pieces of carrot, mangold, or turnips in the ground, and taking them up every few days to collect the wireworms feeding on the bait. Millipedes may also be caught in this way, but for them large, hollow, more or less rotten, roots should form the bait. It has also been found that the small millipedes (*Julus pulchellus*) may be caught in numbers by placing on the ground cabbage leaves soaked in a solution of Paris green (1 oz. to a gallon of water); the millipedes come to the surface at night, and feed upon the poisoned leaves.

Peat moss litter manure is always attractive to millipedes and other pests, and should be avoided. Lime, if applied in proper quantity, seems to check the increase of millipedes, but has no effect upon wireworms.

ADULTERATION OF FOOD IN SCOTLAND

According to the seventh annual Report of the Local Government Board for Scotland (Cd. 1051) the number of samples examined under the Sale of Food and Drugs Acts during the year ended 30th September, 1901, on behalf of Local Authorities, was 5,493, of which 650, or 11·8 per cent., were found to be adulterated.

Prosecutions were instituted in respect of 330 of the 650 samples reported to be adulterated. In 221 cases convictions were obtained; in 66 the charges were withdrawn; and in 43 there was no conviction. Penalties were imposed in 216 out of the 221 convictions; in the other 5 the vendors were admonished. The penalties amounted to £641 3s. 8d., and, in addition, the offenders were found liable in costs amounting to £50 14s. 4d., the penalties and costs together being £691 18s., or, on an average, £3 2s. 7d. for

each conviction. In the 66 cases which were withdrawn, costs were allowed against the defendants to the amount of £59 10s., an average of 18s. per case. In two cases found not proven the costs on the accused amounted to 10s. 6d. each. The total costs charged to the Local Authorities in the 330 prosecutions amounted to £278 1s. 1d., or an average of barely 16s. 10d. per prosecution.

Of 2,031 samples of milk examined, 372, or 18·3 per cent., were reported to be adulterated. The common forms of adulteration were abstraction of fat and addition of water. Sometimes, however, the analysis showed that skim milk had been added to new milk, or that fat had been abstracted and water also added.

Of 653 samples of butter examined, 59, or 9·0 per cent., were reported to be adulterated. In a considerable proportion there was gross adulteration. No fewer than 39, or 66 per cent., of the adulterated samples contained more than 70 per cent. of foreign fat. Fifteen of them were reported as wholly margarine; 10 as containing from 90 per cent. to 99 per cent. of foreign fat; 9 from 80 per cent. to 90 per cent.; and 5 from 70 per cent. to 80 per cent.

Of 131 samples of cheese examined, 9, or 6·9 per cent., were reported to be adulterated. Three of the samples contained respectively 20 per cent., 25 per cent., and 33 per cent. fat other than butter fat; 4 were reported as margarine cheese, one was reported as machine skimmed milk cheese almost devoid of fat, and one as skimmed milk cheese.

Of 158 samples of margarine examined, eight, or 5·1 per cent., were reported to be adulterated—all on the ground that they contained boric acid—the amounts varying from 3 grains to 16 grains per pound.

No proceedings were taken for adulteration of margarine, but forty-nine prosecutions were instituted under the Margarine Act of 1887, the articles not having been duly labelled. In 40 cases convictions were obtained; in 7 the charges were withdrawn; and in the remaining two cases there was no conviction.

COMPOSITION OF BARLEYS.

In connection with an article contained in the *Journal of the Board of Agriculture* for December, 1900, as to the composition of barleys grown after roots in Kent in 1899, it may be of interest to notice the result of the analyses of a number of samples of barley supplied to the South Eastern Agricultural College, Wye, by the authorities of the Brewers' Exhibition.

Of the fourteen samples supplied by that institution and submitted to analysis, seven were high-class barleys, prize-winners in their respective classes; four others were picked out as poor barleys, which could hardly be sold as malting barley; and, finally, by way of comparison, three highly-placed foreign barleys were also analysed.

The mean average results of the analyses of the above three classes of barleys will be found compared in the accompanying table with the mean average analyses of barley grown in 1899 after roots eaten off:—

—	Barley after Roots, 1899.	Prize Barleys, 1900.	Poor Barleys, 1900.	Foreign.
Water	16·23	16·3	16·8	15·2
Proteids	9·15	7·4	8·2	7·85
Starch	57·9	61·5	58·0	61·5
Crude fat	1·65	1·5	2·28	1·93
Crude fibre	4·1	3·8	3·82	4·12
Ash	2·27	2·23	2·08	2·24

The prize English barleys were poorer in proteids or nitrogenous matter, and richer in starch than any others; whereas the barleys grown after roots were the richest in nitrogenous matter and poorest in starch. Four barleys with the lowest proteid content were those which received the highest awards among the prize barleys. In the four inferior samples of English barley the so-called oil, which really represents matter of all sorts soluble in ether, was distinctly above the average, whilst the proportion of ash was low. This indicated that one cause of their inferiority was probably due to washing by rain, which had reduced the mineral matter; followed by some heating in stack, which had

resulted in the production of matter soluble in ether. The determinations of the flinty and mealy corns in the case of the English barleys agreed very closely with the classification; the prize barleys averaged less than 5 per cent. of flinty corns, while the inferior samples averaged 25 per cent.; and the barleys which were grown after roots in the previous season averaged about 13 per cent. of flinty grains. The chemical analyses and mechanical examination of these barleys are all held to confirm the conclusions of previous investigations—that high quality in barley is linked with a high starch and a low proteid content, factors which are not readily attained when barley is grown after roots folded off.

THE STERILISATION OF DAIRY UTENSILS.

For the sterilisation of separators, churns, butter-workers, ripening vats, and other dairy appliances, the best and cheapest method, according to Dr. Cherry, M.D., Lecturer in Bacteriology, Melbourne University, is to fill them with water containing ordinary washing soda, in the proportion of 1 lb. to 20 gallons, and turn the steam into it by means of a piece of hose until the water boils. This plan was introduced in 1892 for the purpose of sterilising the surgeon's instruments before an operation. It is now very generally used by surgeons, and in the bacteriological laboratory it is implicitly relied upon for all purposes. Not only are all known bacteria killed by momentary exposure to the boiling soda solution, but their spores or seeds are also destroyed. These spores resist a heat which no other living animal or vegetable tissue can withstand. The advantages of using soda in the dairy and butter factory are enhanced by the fact that it unites with the lactic acid present, forming a soluble lactate of soda, and also with the grease, forming an easily soluble soap. It therefore accomplishes the double object of cleansing and sterilising at the same time. Furthermore, it has the great advantage

of not rusting or injuring any metal with which it comes in contact. Another important matter, from the bacteriological point of view, is that all utensils and machinery, from the pail onwards, should be washed and sterilised immediately after use. When a few drops of milk or cream are left behind, the bacteria, which they are sure to contain, begin at once to multiply. In a few hours there are many thousands, or even millions, instead of a few hundreds; it is then not only more difficult to complete the cleaning, but, unless the boiling soda is used, a plentiful sowing will be present to begin growing in the next fluid which is put into the utensil. This is the reason, Dr. Cherry points out, why skim milk turns sour so quickly when emptied into the pig's barrel, and it also explains much of the difficulty of bringing up infants on the bottle. The barrel and the bottle are alike in this respect, that they are both seldom effectively cleaned. The amount which is left behind may be so small that it is not observed by the eye, but it is quite sufficient to enable the tiny germs to get a foothold and to grow. Trouble is saved by never putting away a dirty utensil.

[*Journal of the Department of Agriculture of Victoria, March,* 1902.]

AGRICULTURAL WAGES IN 1901.

The increase in agricultural wages, which has been recorded in the Returns collected by the Board of Trade in each year since 1895, is again shown in the figures for last year.

The districts reported on in which an increase in wages took place in 1901 contained 159,456 agricultural labourers, according to the 1891 census, while decreases were reported in districts in which the number of labourers was 13,086. The net increase per week in the districts reported on amounted to a general rise of 5½d. per week per head of those affected.

This is not so large a rate of increase as that reported in the four preceding years, and the number of labourers

affected shows a falling off as compared with 1898, 1899, and 1900.

The following table shows the net effect of the yearly changes in England and Wales in each year, in districts where changes were recorded, from 1895 inclusive.

Year.	Total Number of Labourers in Districts Affected.	Average Amount of Change in Weekly Cash Wages per head of Labourers in Districts Affected.
	No.	d.
1895 - - - -	119,890	5¼
1896 - - - -	99,329	1
1897 - - - -	87,385	6½
1898 - - - -	217,037	8
1899 - - - -	195,439	8
1900 - - - -	281,262	8½
1901 - - - -	172 542	5½

The Eastern and Midland counties, as usual, reported a greater number of changes than all the remaining counties of England and Wales together. The number of farm labourers in districts affected by changes in wages in this group of counties was 95,935 or 55·6 per cent. of the total number of labourers in all districts affected. Of the 95,935 men, 83,744 were in districts in which there was an average increase of 6d. per head per week, and 12,191 in districts in which wages fell 9¼d. per head per week. The net effect of all the changes reported in the Eastern and Midland counties was an average increase of 4d. per head per week, as compared with the net advances of 9¼d. in the Northern counties, 8¼d. in Yorkshire, Lancashire, and Cheshire, 6½d. in the Southern and South-Western counties, and 8¼d. in Wales.

As regards Scotland, the increased rates of wages obtained in the previous year were, generally speaking, well maintained at the hirings held between February and July 1901, and in many cases wages rose still further, particularly in the case of women and of men having "women workers" in their families. At the hiring fairs held during the latter half of the year there was but little change in wages, and in nearly

every district, farm servants who remained in their places, obtained their former rates; but, owing to the somewhat larger attendance than usual of farm servants at the fairs, those who sought new places not infrequently had to accept slight reductions. In a few districts, however, wages had an upward tendency, and in most districts the scarcity of women at the hirings caused a rise in the wages offered to them.

Returns received from 68 correspondents in various parts of Ireland show that, although there was not a general movement in agricultural wages in 1901, there was an upward tendency in a number of districts As was the case last year, the wages of hired men who are lodged and boarded in the farmhouses, show the greater number of changes, the rates paid to this class being frequently £1 to £2 per annum (and in a few districts up to £4) higher in 1901 than in 1900. The upward movement of wages in Ireland is again ascribed to the growing scarcity of labour partly due to emigration.

(*Labour Gazette, May,* 1902.)

THE AMERICAN IDEAL TYPE OF BEEF CATTLE.

A report has recently been issued by the Bureau of Animal Industry of the United States Department of Agriculture, on the American Breeds of Beef Cattle. The writer of the report, Mr. G. M. Rommel, Expert in Animal Husbandry, furnishes the following definition of an ideal animal of beef type:—

"The first point observed in an ideal animal of beef type is his form. This will approximate to the rectangular. It will show a body that is compact, symmetrical, broad, deep, and close to the ground. Legs are only of use to carry the animal around. He is 'straight in his lines,' that is, the lines from the top of the shoulder to the tail head, and from the brisket back to the purse, are as nearly parallel as possible, as are also those from the centre of the shoulders to the centre of the thighs, no deviation from the horizontal being allowed

the top line. This will give the form a rectangular appearance.

"The head shows a 'good feeder.' Observation and experience show a good feeding head to be broad and well filled between the eyes, with a good roomy brain box, tapering nicely, and short from the eyes to the muzzle, which should be wide and clean cut, with large, well open nostrils. A large mouth is usually the first indication of good digestive capacity, and large, open nostrils go with good lung power and a strong constitution. The whole head is clean cut, with no superfluous flesh on the jaws. The horns, if present, are of medium size and not coarse; ears of medium size, gracefully and actively carried. The eyes are large, full, bright, clear, and placid. The neck of most animals of extreme beef type is reduced to the shortest degree possible with usefulness; it is moderately full, with clean cut throat, large, well defined windpipe, and little or no dewlap. The neck joins the shoulder in full, even lines, swelling into the shoulders as it were. Shoulders are moderately sloping, well covered with flesh, smooth, deep and wide; tops of shoulders compactly covered with smooth flesh. The chest wide and deep, with the crops full and heart girth full. The brisket will be wide and projecting forward, carrying a moderate amount of flesh. The ribs are well sprung, long, and close together, giving the animal plenty of room for the work of the organs of the chest and abdomen. The space between the last ribs and the hips is short, giving the body a compact appearance.

"Thus far we have concerned ourselves with the parts that have to do with the organic nature of the body. Along the back, from the shoulders to the hips, we find the most valuable meat in the animal's carcase. Here, then, we have the greatest width and depth of flesh possible. The spring of the ribs mentioned, the length and breadth of back and loin, and, above all, the depth of flesh on ribs, back, and loin, are absolute essentials of the beef type.

"The hips are of medium breadth, well covered and smooth, the rump long, wide, and well filled in from hips to tail head. The thighs are wide, deep and full, and the same description applies to the twist. The flesh of the hindquarters is carried

well down to the hocks. Legs are short, straight, and strong, with fine, clean bone, and set well outside the body.

"Above all, every part of the body of an ideal beef animal shows 'quality.' It is this that tells the farmer whether a steer with a good form will prove a profitable feeder, it tells the butcher whether the animal will 'kill' well. This is a point that cannot be overlooked and is difficult to describe. Lack of it shows in a coarse, fleshy head, in a thick, meaty throat, and a rough uneven shoulder. Coarse heavy bones, and a loose jointed appearance generally, will show the undesirable feeder; rough flesh, 'ties' and 'patches' the undesirable killer. The animal handles well. The flesh is mellow and firm, showing a proper mixture of fat and lean. The skin is loose but not superfluous, mellow, and moderately thick, covered with a plentiful growth of hair. Such an animal usually weighs 1,500 pounds at twenty-four to thirty months."

THE HORSE TRADE OF THE UNITED STATES WITH FOREIGN COUNTRIES.

The foreign trade of the United States in horses and mules has greatly expanded since 1893, when the low prices which then prevailed had much to do with attracting the attention of foreign buyers to the supplies in the country. The result was immediately reflected in the export trade. Exports of horses and mules combined, which in 1893 had amounted to 4,601 head, valued at about £200,000, rapidly increased until in 1898 they reached the total of 59,248 head, worth nearly £1,500,000. In the following year the outbreak of the war in South Africa gave an additional impetus to this trade, and the exports from the United States quickly responded to the increased demand. In the fiscal year ended June 30th, 1900, the exports of horses and mules combined rose to 108,091, valued at £2,400,000, and in the succeeding fiscal year they further increased to 116,655 head, with an estimated value of £2,500,000.

The table given below shows the exports of horses and

mules from the United States, and the imports of horses into that country, during each of the years ending June 30th, 1892 to 1901, inclusive. There are no imports of mules into the United States.

Year ending June 30th.	Horses.		Mules.
	Imports.	Exports.	Exports.
	No.	No.	No.
1892 - - - - -	14,074	3,226	1,965
1893 - - - - -	15,451	2,967	1,634
1894 - - - - -	6,166	5,246	2,063
1895 - - - - -	13,098	13,984	2,515
1896 - - - - -	9,991	25,126	5,918
1897 - - - - -	6,998	39,532	7,473
1898 - - - - -	3,085	51,150	8,098
1899 - - - - -	3,042	45,778	6,755
1900 - - - - -	3,102	64,722	43,369
1901 - - - - -	3,785	82,250	34 405

Until the outbreak of the war in South Africa, the United States export trade in horses was practically confined to Europe and North America. In the years ending June 30th, 1900 and 1901, however, South Africa took 10,220 and 37,465 head, respectively, out of the 64,722 and 82,250 horses exported in those two years.

With the exception of shipments in recent years to South Africa, Hawaii and the Philippines, the export trade of the United States in mules has been confined almost exclusively to the Western Hemisphere. The great expansion in the trade shown in 1900 was chiefly due to the shipments of 31,014 head to South Africa, 1,260 head to Hawaii, and 1,703 head to the Philippines. In 1901 the total shipments of mules from the United States were 8,964 head less than in 1900; but in view of the fact that figures showing the countries of destination of last year's exports are not yet available, the causes of this falling off are not apparent.

[*United States "Crop Reporter," April*, 1902.]

HORSE TRADE OF CANADA.

The following table, showing particulars as to Canadian imports and exports of horses in each of the years 1891 to

1901, inclusive, is quoted from the April number of the United States *Crop Reporter*.

Year ending June 30.	Imports.	Exports.				
		To United States.	To Great Britain.	To South Africa.	To all other Countries.	Total.
	No.	No.	No.	No.	No.	No.
1891	3,495	9,957	1,222	—	479	11,658
1892	2,623	9,261	1,369	—	433	11,063
1893	2,171	10,606	1,946	—	667	13,219
1894	1,857	4,490	3,510	—	734	8,734
1895	1,797	6,604	7,430	—	710	14,744
1896	2,860	4,021	17,179	—	652	21,852
1897	4,518	3,696	13,720	—	2,577	19,993
1898	12,900	2,457	11,479	—	413	14,349
1899	15,114	6,284	5,810	—	290	12,384
1900	12,101	1,527	5,044	3,287	195	10,053
1901	9,069	2,088	2,143	3,063	315	7,609

It will be observed that the Canadian export trade in horses, which reached the high record mark of almost 22,000 head in 1896, has since undergone a steady and rapid decline, having reached a lower level last year than at any time within the past twenty-five years. Imports of horses into Canada, on the other hand, have increased since 1896 in an even greater ratio; and the Canadian foreign trade in these animals, which, up to 1898, had been characterised by a heavy excess of exports over imports, has been completely reversed, more horses having been imported during the past three years than were shipped abroad.

THE RABBIT PLAGUE IN GERMANY.

Of late years a great increase in the number of rabbits has been observed in Germany, and districts hitherto unaffected have been seriously invaded. Crops, including vineyards and plantations, have been much damaged, and military training grounds have, in some cases, been rendered dangerous for cavalry and artillery exercises. It has therefore been considered necessary to devise means for getting rid of

the troublesome rodents, and a report on the results of the attempt has recently been issued.*

The three substances experimented with were acetylene, pictoline, and carbon bisulphide.

Acetylene is easily and cheaply generated, but as it is lighter than air it was found to be extremely difficult to distribute throughout the rabbit burrows, and the results of its use hold out no prospect of success.

Pictoline is a mixture of sulphurous acid and carbonic acid, and can be obtained in a liquid form in steel cylinders. Besides having an injurious effect on human beings, there are mechanical difficulties in dealing with it, and the results of its use can only be characterised as moderately successful.

Carbon bisulphide has long been used for insecticidal purposes, *e.g.*, in connection with phylloxera and granary insects, but although it is extremely poisonous to the lower animals, it has much less effect on man. It is sold as a liquid, which rapidly evaporates when exposed to the air. The great weight of the vapour as compared with air makes it comparatively easy to avoid bringing the respiratory organs into contact with it, while the same property enables it to penetrate into the deeper recesses of a rabbit's burrow. It is, however, very inflammable, and must therefore be transported and used with great caution. Although its smell is most repugnant to human beings, it does not seem to be distasteful to rabbits, which consequently appear to make no special effort to avoid it.

The method of application that was found to work best in practice was as follows:—Eight or ten labourers, under strict supervision, and each provided with a supply of carbon bisulphide in a spouted can, moved systematically over the ground, placing pieces of tow, wood-wool, old sacking, hay, or similar material, soaked in the liquid, in each rabbit burrow. It was found that 20 ccm of the poison per burrow was necessary but sufficient, and this is the quantity that a piece of sacking about 15 inches square will absorb. When the material was

* Beobachtungen und Erfahrungen ueber die Kaninchenplage und ihre Bekämpfung by Dr. A. Jacobi in Arb. aus der Biol. Abtheil. für Land und Forstwirthschaft am Kaiserlichen Gesundsheitsamte, Band ii., Heft 4, 1902.

soaked with the poison it was pushed by means of a stick as far as possible into the burrow, and all openings were immediately closed with soil or snow. In large burrows it is desirable to supply a double dose of the poison.

It was found that there were certain advantages associated with undertaking the work during snow. Under such circumstances it is easy to see which burrows are inhabited, and snow is a more convenient material than soil with which to stop the openings of the burrows.

The cost for carbon bisulphide and sacking was found to amount to about a half-penny per burrow. The outlay for labour varied so much with the character of the ground, the abundance of the burrows, etc., that it is difficult to venture on an estimate.

FORESTRY IN RUSSIA.

Professor Schwappach of the Forest School of Eberswalde, in Prussia, last autumn undertook, on the invitation of the Director of Russian State Forests, an extensive tour of inspection of Russian forests, and his report has recently appeared in the Zeit. für Forst-und Jagd-Wesen.

The total extent of the forests of Russia in Europe, including Finland, is put at more than five hundred million acres, or 33 per cent. of the total surface of the country. The distribution of the forests is extremely unequal. In the north there are wide regions that show no more than 10 per cent. of interruption in the wooded surface, whereas in the south the percentage of forest land is hardly greater than in this country, and on the Steppes it is even less. Of the total forest area the State owns considerably more than half, the great landlords about a quarter, and the peasants, communes, etc., the remainder.

In the north the prevailing species are Scots pine and spruce, while birch and aspen are of subordinate importance, though these are much in evidence along the lines of railway, where

the conifers have often been exterminated by forest fires. In the south, oak, ash, elm, lime, and sycamore constitute the bulk of the forests.

In Finland, as in Scandinavia, Prof. Schwappach observed that the Scots pine has a habit somewhat different from that which it assumes in Germany. The stem is straighter, while the shape of the crown somewhat resembles that of the spruce. The lower branches die off sooner, so that the stems are strikingly clean grown. Prof. Mayr has also called attention to this state of things, and attributes the earlier death of the lower branches to the fact that in a cold climate they cannot stand so much shading as is the case further south.

It is curious and interesting to note that in Finland the Scots pines are considerably damaged by the shepherds, who strip off the bark and use the cambium and soft bast as an article of food.

Everything is done on a large scale in Russia. The main forest divisions, each of which is placed under an officer, average over 150,000 acres each, whereas the corresponding unit in Germany is five to ten thousand acres.

Since 1895 a rough forest survey has been undertaken in this way, that rides 13 feet wide, running north and south and east and west, have been cut through the forests, so that the whole area has been laid out in rectangles of nearly 20,000 acres each. In the more accessible regions the sub-division has been carried somewhat further. By traversing these rides, and taking note of the character of the timber that adjoins them, a rough estimate can be formed of the volume of the growing stock.

Growth in the northern regions is slow, and in estimating the productive capacity of Russian forests this fact has to be kept carefully in view. Conifers do not reach a useful size under 150 years, while, as regards height, the maximum for the spruce may be put at 90 feet, and for the Scots pine at 10 feet less. The heaviest class of stems is formed by trees having a diameter at breast height of 18 to 30 inches, and of this class there are not usually more than one or two specimens on an acre. The bulk of the crop consists of much smaller stems, of which there are usually about 50-60 per acre.

An average crop at the felling period will not, as a rule, exceed 800 cubic feet per acre, quarter girth measure.

The financial returns vary considerably, but in the north it is seldom that growing timber fetches more than 1d. per cubic foot, while the nett return per acre is generally below 6d. In the middle and south, where timber is scarce, some forests give a nett income of £1 per acre or more.

The Government desire an extension of the wooded area in the Southern provinces, and with this object in view State nurseries, some up to 200 acres in extent, have been created, and, from these, private planters are supplied with young trees at cost price. Plants that fail to establish themselves are replaced free of charge, a system, as Prof. Schwappach points out, that tends to induce careless work.

Several interesting methods of regeneration are noted in the report. It seems to be a difficult matter to obtain money from the Treasury for planting operations, and this has compelled the forest officers to cast about for a means of having the work done without the charge appearing in their accounts. In some districts, for instance, it is a common practice for the buyer of timber to enter into a contract to replant the area which he clears. In other districts the ground from which the timber has been cleared is handed over to the peasants, who undertake to grub out the stools and to plant lines of trees five feet apart, in return for which they get the stool-wood for fuel, and the right to cultivate farm crops between the rows of trees for three or four years.

The attempt to afforest portions of the treeless Steppes has been very unsuccessful. Woods formed in that region grow fairly well for 30 or 40 years, but after that age many of the trees die, as a consequence, it is said, of their roots penetrating a stratum of soil heavily charged with alkali salts.

The conditions in certain parts of the Crimea are characterised as extremely favourable for tree-growth. The most important tree in some districts of this peninsula is *Pinus taurica* hort. (*P. laricio pallasiana* Endl.), which reaches a height of 130 feet and a volume of 12,000 cubic feet per acre.

Belgian Agricultural Returns.

The Belgian Agricultural Returns, which it is intended to issue annually henceforth, have now been issued for 1900. As these annual returns are only collected from occupiers cultivating at least one hectare ($2\frac{1}{2}$ acres), no comparison can be made with the agricultural inquiry of 1895. Particulars are also omitted for a few minor crops, such as hemp, etc. It may be noticed, however, that the area accounted for in 1900 is fully 300,000 acres below the area recorded as under the same crops in the more comprehensive inquiry of 1895. The omission of all the farms under $2\frac{1}{2}$ acres naturally affects the statistics of certain crops more than others; and to this may probably be ascribed the small area (108,000 acres less than in 1895) under potatoes, often largely cultivated on such small holdings as have been omitted. The decrease of some 170,000 acres since 1895 in the cereal crops is, however, probably to a very great extent real.

The following table shows the area and production of the principal crops in 1900:—

Crop.	Area.	Production.	Yield per acre.
	Acres.	Bushels.	Bushels.
Wheat	417,326	13,783,776	33·0
Rye	605,555	18,524,150	30·6
Barley	94,917	4,566,538	48·1
Oats	625,567	32,136,490	51·4
Flax	49,929	—	—
		Cwts.	Cwts.
Sugar-beet	156,882	42,904,547	273
		Tons.	Tons.
Mangolds	117,799	2,706,997	23·0
Potatoes	348,398	2,354,156	6·8
Red clover (production as hay)	248,571	501,271	2·02
Other clovers ,,	71,245	99,646	1·39
Lucerne ,,	24,722	52,567	2·13
Sainfoin ,,	25,792	44,386	1·72
Grass for hay ,, (1st cut)	518,221	767,023	1·48
,, not for hay	499,649	—	—
Orchards	121,193	—	—

It would seem that since 1895 there has been a decline in the area under wheat, rye, flax, turnips and swedes (as main crop), clover and lucerne, and meadow hay. On the other hand, increases are to be noted under oats, sugar-beet, mangolds, sainfoin, and especially grass not cut for hay.

Apart from mangolds, roots are grown chiefly as catch crops, and the following details are given for turnips and carrots :—

Crop.	Main Crop.			Catch Crop.		
	Area.	Production.		Area.	Production.	
	Acres.	Total.	Per Acre. Tons.	Acres.	Total. Tons.	Per Acre. Tons.
Turnips - -	12,049	137,668	11·4	311,474	3,242,004	10·4
Carrots - -	8,107	94,158	11·6	40,488	260,681	6·4

On 65,339 acres spurrey was grown as a second crop yielding 5 tons per acre, or 325,848 tons altogether.

The enumeration of live stock shows 241,553 horses, employed in agriculture, 1,657,494 cattle (including 828,445 dairy cows), and 1,005,501 swine. Sheep are not recorded. Cattle show a noticeable increase since 1895, when 1,420,978 (including 802,271 dairy cows) were returned; while swine show a decline, doubtless owing to the omission of animals on farms of less than 2½ acres.

THE AGRICULTURAL BANK ACT (QUEENSLAND), 1901.

By an Act passed last year by the Queensland Legislature, the Governor of the Colony in Council was authorised to establish and maintain an Agricultural Bank, which should have power to make advances to farmers and cultivators for the purpose of effecting improvements on their holdings. Such advances are only to be made upon the security of mortgages over the lands and improvements with respect to which the advances are made, and upon such other security as the Governor may think fit. No advance shall exceed thirteen shillings in the pound of the fair estimated value of the proposed improvements, and at no time must the advance or advances to any one person exceed the sum of £800.

Interest is to be paid by the borrower at the rate of 5 per cent. for the first five years; after which the amount must be

paid off within a term of 20 years by half yearly instalments of £4 0s. 3d. for every £100.

The funds necessary for the administration of the Act are to be raised by the issue of debenture stock at a rate not exceeding 4 per cent., charged on the revenues of the Colony in addition to moneys appropriated by Parliament.

UNITED STATES PRODUCTION OF HONEY AND WAX.

According to the April number of the *Crop Reporter*, the Census returns indicate that the number of swarms of bees reported from 707,000 farms in that country in 1900 was 4,110,000, of an estimated total value of over £2,000,000.

The total production of honey in 1899 is placed at 61,196,000 pounds, as compared with 63,897,000 pounds returned in 1889; while the amount of wax produced was 1,765,000 pounds, or 600,000 pounds more than the yield in 1889. These figures appear to denote a tendency on the part of the apiarists to devote more attention to the production of wax than formerly, the proportions being, approximately, 55 pounds of honey to one of wax in 1889, as against 35 of honey to one of wax in 1899. The aggregate value of the honey and wax produced in 1899 is estimated at £1,389,000.

AGRICULTURAL EXHIBITION AT VILNA.

The Board have received information through the Foreign Office that an agricultural and industrial exhibition will be held this year at Vilna between the 13th and 21st of September. The exhibition will comprise agriculture, live stock, dairy-farming, agricultural machinery and implements, horticulture, bee-keeping, pisciculture and fishing, forestry and timber industry, farm construction, agricultural and factory industries, hand manufactures and minor industries, and general science.

It is stated that the importance of these agricultural shows is increasing, and the present time is considered particularly opportune for British firms to push their goods, as there is a

widespread opinion that when the Russo-German treaty ends in 1903, Russia will have to seek new sources of supply for such articles as have hitherto been chiefly bought in Germany.

It is further reported that American firms are making great efforts to wrest from the Germans the trade in agricultural machinery and implements, and some of the Polish agricultural societies have obtained from Americans the same terms as to prices and credit as they have hitherto enjoyed from Germans. It may therefore be concluded that England could also do business with Poland on a large scale; and as these agricultural shows give the opportunity of studying the necessities of the different provinces and people, and bring merchants into direct contact with buyers, it would be important for English firms to take part in this show.

SUGAR BEET AND CHICORY CULTIVATION IN THE NORTH OF FRANCE.

H.M. Consul at Lille has reported to the Foreign Office that the unsatisfactory state of agriculture and the increasing use of saccharin weighs heavily on the sugar industry, which is on the verge of a real disaster in his district. Prices of sugar went down suddenly from 25 to 28 per cent. in 1901, owing principally to over-production. The crop and quality of beetroot were exceptionally fine, but the bounties on sugar also contributed to this excessive production.

Owing partly to the fall in the price of beetroot, the production of chicory has greatly increased in the Nord Department, and its cultivation has received an impetus owing to the fact that manufacturers now accept chicory "with tare" instead of insisting, as formerly, that it be delivered washed and ready for use. Nine manufactories of chicory are stated to exist in the immediate neighbourhood of Calais, and new factories are being started in outlying villages. The parts of the Pas de Calais and Nord Departments near the coast are specially favourable for the cultivation of this plant, as it grows well in light sandy soils, and requires but little manure in suitable localities.

[*Foreign Office Report, Annual Series, No. 2,768.*]

THE BUTTER INDUSTRY IN ARGENTINA.

The imports of butter into the United Kingdom from the Argentine Republic increased from 10,860 cwts. in 1897 to 22,787 cwts. in 1901, in which year H.M. Consul at Buenos Ayres states in his last report to the Foreign Office that the butter trade made very considerable progress. There are moreover opportunities for the development of the industry, as 20,000,000 head of cattle exist in the country, and the Argentine summer coincides with the European winter. No provision is made for milch cows at the annual cattle shows of the principal agricultural society, and it was quite impossible not long ago to get milk or butter at a farm where thousands of cattle were kept. This is, however, being rapidly altered.

[*Foreign Office Report, Annual Series, No.* 2,767.]

Tuberculin Test for Cattle Exported to Canada.

The Board of Agriculture are informed by the High Commissioner for Canada that the Canadian Government have sent Mr. A. G. Hopkins, Veterinary Quarantine Officer for Canada, to this country, to apply the tuberculin test to all cattle over six months old intended for export, for breeding purposes, from the United Kingdom to Canada. All communications regarding the testing of animals should be addressed to Mr. Hopkins, at the Canadian Government Agency, 52, St. Enoch Square, Glasgow.

Argentine Chilled Beef.

H.M. Consul at Buenos Ayres refers to the export of chilled beef from Buenos Ayres as a new industry which was inaugurated in 1901. The chilling process maintains the atmosphere in which the meat is kept at such a temperature that the meat keeps fresh until placed on the market. It appears that actually freezing the beef reduces the juices to particles of ice, and the solid matter is incapable of reabsorbing the juices when subsequently thawed. The liquid consequently drains away, and the meat deteriorates. The first shipments of chilled

beef were made in August, 1901, when 24,700 quarters were sent. The results obtained were satisfactory, and about ½d. per lb. more was obtained for forequarters, and 1d. per lb. for hind-quarters, than in the case of the frozen article.

[*Foreign Office Report, Annual Series, No.* 2,767.]

Russian Sunflower Seed Cake.

The cultivation of the sunflower for industrial purposes has been for some time a feature of the rural economy of the Governments in the south and south-east of Russia, and within the past three or four years the cultivation of the sunflower plant for the manufacture of oilcake has been extensively adopted by the peasantry and farmers in the Novorossisk district of Russia. The industry, which is said to be remunerative, is rapidly increasing, and promises to still further develop. It is claimed that the sale of the oilcake produces in itself more than enough to cover all the working expenses of the mills. The stalks of the sunflower plant are used as fuel for driving the machinery, and the ash that remains gives from 25 to 30 per cent. of potash. Generally speaking, it would appear that the sunflower seed when properly crushed yields 23 per cent. of oil, 40 per cent. of oilcake, and 37 per cent. of stalk.

[*Trade of Batoum and District.—Foreign Office Report, No.* 2782.]

Hydrophobia in England and Wales.

In the Annual Report of the Registrar-General of Births, Deaths, and Marriages in England and Wales, it is stated that the year 1900 is the second year on record (the first being the year 1899), in the course of which not a single death from hydrophobia is reported to have occurred.

In the ten years immediately preceding 1899 as many as 104 deaths were attributed to this disease, the numbers in separate years reaching 30 in 1889, and 20 in 1895.

The Russian Beet Sugar Industry.

A statement published in the United States *Crop Reporter* for April shows that the number of beet sugar factories operating in European Russia in 1901–02 is 276, against 271 in 1900–01, 268 in 1899–1900, and 242 in 1898–99. The area under beet was 1,377,754 acres, against 1,308,671 acres in 1900-01, 1,200,443 acres in 1899–1900, and 1,084,507 acres in 1898–99. It appears from a comparison of these figures that during the four years named there was a continuous increase in the area devoted to sugar beet, and that the total increase within the quadrennial period amounted to 293,247 acres, or a fraction more than 27 per cent. On an average for the four years, 32·7 per cent. of the total area was on land pertaining to the sugar manufactories, but in 1901–02 the proportion on such land was a little less, being 30·3 per cent.

Maize Oil and Maize-oil Cake.

Maize oil and maize-oil cake are by-products from the manufacture of maize into glucose and grape sugar. The oil is of a reddish-yellow colour and of pleasant taste. It is used in the manufacture of paints, leather dressing, various kinds of soap, and rubber substitute. Corn-oil cake, the residue after expressing the oil, is valuable as an animal food, especially for dairy cattle.

Only the germs of maize are used in oil extraction, these being separated from the rest of the grain by a mechanical process. They are ground into a powdery meal, heated, and the oil expressed by a process similar to that used for obtaining linseed oil from flaxseed. The residue of the maize, after separating the germs, is utilised in the manufacture of a starch, from which is derived a great variety of products, such as special starches, dextrines, gums, glucose, and grape sugars.

The exports of maize-oil from the United States increased from 2,647,000 gallons in 1898, to 4,809,000 gallons in 1901; while the exports of maize-oil cake advanced from 2,203,000 pounds in 1898, to 4,889,000 pounds in 1900.

[*United States "Crop Reporter," April,* 1902.]

Danish Egg Trade.

In the depressed condition of agricultural industry of late years in so many of the European countries people have learned to pay increased attention to the production of eggs, an article of easy sale and increasing universal consumption. The exportation of eggs from Denmark now exceeds in value that of horses and live cattle together, the shipments having amounted in 1901 to 19,010,000 scores, valued at £1,181,000. These exports consist solely of eggs of Danish produce. About 2,000,000 scores of foreign eggs, mostly Russian, were imported into Denmark in 1901 for the home market and confectionery purposes.—*Smór Tidende.*

Swedish Butter and Cheese Factories.

In 1900 the total number of butter and cheese factories in Sweden was 1,688. Of these 1,215 were creameries, 287 cheese factories, and 186 combined creameries and cheese factories. The total quantity of milk handled by the factories was 842,280,576 kg. The creameries manufactured 26,114,018 kg. butter, 3,265,734 kg. full cream cheese, 1,463,370 kg. half cream, 182,809 kg. quarter cream, and 2,523,542 kg. skim cheese. The number of butter or cheese factory patrons was 68,947.

Export of Butter from Sweden.

H.M. Consul at Stockholm reports that the total amount of butter exported from Sweden during 1901 was 18,775 tons, a decrease of about 2 per cent., compared with the previous year. The total amount of butter sent to the United Kingdom showed a considerable falling off, whereas the export viâ Denmark is reported to have increased, especially as regards well-known brands. According to a report issued by the *Smörpröfningarne* (Butter Testing Association), the quality of butter produced by the dairies connected with the society, all of which send in their butter for examination, showed improvement compared with that of 1900. This is, however, not the case if the average quality of all the butter

that was produced in 1901, be compared with that of the previous year. The inferiority is said to be due to the very dry weather, which caused a number of dairies to suffer from the want of sufficient supplies of ice and water.

[*Foreign Office Report, Annual Series, No. 2,778.*]

Breeding Stock for South Africa.

The official journal of the Cape Department of Agriculture states that there can be no doubt that the opportunity to get possession of cattle of first-class breed would be eagerly seized by many stock-breeders in Cape Colony. "Throughout South Africa," the Journal states, "there are numerous well-to-do farmers, who, if the chance were given them to inspect high-priced animals of good pedigree, landed at Cape Town, Port Elizabeth, or East London, would willingly take the trip and pay the price. For the enterprising breeder oversea there is a good thing to be done in this way, if he will venture, gradually at first if he chooses, to approach our markets with his samples. To him we would offer excuses for any timidity shown by our farmers in reference to sending orders abroad 'on spec.,' for they have been so beset by diseases and 'political' troubles that *wacht een beetje* seems to have become a kind of industrial creed for the nonce. Still we think they will yield readily to temptation if presented in the way suggested."

[*The Agricultural Journal, Department of Agriculture, Cape of Good Hope.*]

HARVEST AND CROP REPORTS.

Wheat Crop of India.

Wheat-sowings in India were everywhere made under somewhat adverse conditions, owing to the early withdrawal of the monsoon, and the winter rains gave a very inadequate supply of moisture to the land wherever they fell, while they were entirely absent from Western and Central India. A comparatively small yield is anticipated from the wheat grown on unirrigated soil in the Punjab and elsewhere in Northern India, though irrigated wheat has done fairly well. In the Central Provinces, Berar and Bombay, rats and insects have ravaged the crop, already grown on a restricted area, both because of deficient rain at the sowing season and of the greater favour attached by cultivators just then to the cheaper grains. It may be anticipated, therefore, that the wheat crop generally will be substantially below the average.

In the Punjab, the area under wheat is estimated at about 6,119,000 acres, or 22 per cent. less than the area entered in last year's final report. It is thought that owing to the drought, the greater part of the unirrigated area, nearly 3,000,000 acres, will fail, the irrigated crop being about average. In the North-west Provinces the crop on unirrigated land will be poor, and from 75 to 90 per cent. of the normal on irrigated soil. In Bengal, the area sown is estimated at 1,404,000 acres, a yield three-quarters of the average being expected. Prospects are somewhat better in the Central Provinces, but the area sown, about 2,319,000 acres, is 23 per cent. below the average. In Bombay, only 1,670,000 acres, or 37 per cent. below the average, were reported sown.

[*Second General Memorandum on the Wheat Crop of India, 1901-2.*]

Crops in the United States.

The Statistician of the Department of Agriculture states in "The Crop Reporter" for May, 1902, that the area under winter wheat in the United States on May 1st last was about 27,103,000 acres, as compared with 28,267,000 acres in 1901. The condition of the crop at the same date was represented

by the figure 76·4 against 94·1 on May 1st, 1901, 88·9 at the corresponding date in 1900, and 83·2 the mean of the May averages of the last ten years.

The average condition of winter rye was 83·4 as compared with 85·4 on April 1st, 1902, 94·6 on May 1st, 1901, 88·5 at the corresponding date in 1900, and 89 the mean of the May averages of the last ten years.

Meadow hay (86·6) and spring pastures (84·9) were in lower condition on May 1st than at any corresponding period since 1888, with the exception of the year 1899.

The June Report of the Statistician (according to telegrams published in the English papers) states that the acreage sown to spring wheat indicates a reduction of about 2,511,000 acres, or 12·8 per cent. The condition of the spring wheat is represented by the figure 95·4 against 92 on June 1st last year. Winter wheat has declined in condition during the month, and on June 1st stood at only 76·1, which is 4·2 points below the average of the last ten years.

The acreage seeded to oats is reported as four-tenths of one per cent. in excess of that harvested last year; the condition is 0·6 above the ten years' average. The area under barley is 8·5 per cent. greater than that harvested last year; the average condition is well above the mean. The rye sown shows a reduction of five-fifths of one per cent. from that harvested in 1901. Its condition is rather below the average.

THE UNITED STATES HARVEST OF 1901.

The Statistician of the Department of Agriculture has completed his estimates of the acreage, production, and farm value of the cereal crops of the United States in 1901, the grand totals being as follow:—

	Acres.	Bushels.
Corn	91,349,928	1,522,519,891
Wheat	49,895,514	748,460,218
Oats	28,541,476	736,808,724
Barley	4,295,744	109,932,924
Rye	1,987,505	30,344,830
Buckwheat	811,164	15,125,939

In the preparation of this report consideration has been given to the census report on the crops of 1899.

CROPS IN FRANCE.

An official report on the condition of the French crops on the 15th May, 1902, was published in the *Journal Officiel* of the 7th of that month.

The appearance of winter wheat crops was stated to be "very good" in four departments, "good" in fifty-five, "fairly good" in twenty-four, "passable" in three departments, and "indifferent" in one. Spring wheat had been sown in forty-eight departments only. The condition was reported "very good" in three cases, "good" in thirty-two, "fairly good" in ten, and "passable" in three departments.

The departmental reports on the winter and spring oats are as follow: "Very good" in one and four departments respectively; "good" in forty-one and forty-eight; "fairly good" in twenty-two and twenty-four; and less favourable in one and four departments. No winter oats were sown in twenty-two, and no spring oats in thirteen departments. The spring oat crop was not "up" on May 15th in one department.

The condition of winter barley was estimated to be "good" or "very good" in thirty-eight departments and "fairly good" in twenty. The crop was not grown in twenty-nine departments.

The corresponding figures for the spring barley crop are forty-five and twenty-eight departments, and thirteen where the crop was not grown. In one department it was not "up."

The estimated total acreage sown with wheat is 16,789,000 acres.

HARVEST AND LIVE STOCK OF NEW SOUTH WALES.

The Government Statistician of New South Wales has recently published Preliminary Tables of the Agricultural and Live Stock Statistics of the Colony for the year ended March, 1902. From these figures the following table has been compiled, showing the area and production of the principal crops and the number of live stock in the past

season, together with comparative figures for previous years.

Name of Crop.	Area in the Year ended March 1902.	Total Production in Year ended March 1902.	Yield per acre in Year ended March, 1902.	Average Yield per acre in the ten Years 1892-1901.
	Acres.	*Bushels.*	*Bushels.*	*Bushels.*
Wheat - - - -	1,389,434	14,786,059	10·6	10·0
Maize - - - -	189,999	4,838,835	25·5	29·9
Oats - - - -	32,245	687,185	21·3	19·6
Hay Crops :—		*Tons.*	*Tons.*	*Tons.*
Wheat - - -	312,542	286,231	0·9	0·9
Oats - - -	96,785	120,311	1·2	1·0
Lucerne - - -	31,418	64,020	2·0	2·3
Green Fodder - -	87,891	—	—	—

Live Stock.	1901.	1896.	1892.
	No.	*No.*	*No.*
Horses - - -	486,258	510,636	484,309
Dairy Cattle - -	417,666	400,183	365,110
Other Cattle - -	1,627,684	1,825,980	1,856,349
Total Cattle -	2,045,350	2,226,163	2 221,459
Sheep - - -	41,858,000	48,318,790	58,080,114
Swine - - -	265,434	214,581	249,522

AUSTRIAN HARVEST OF 1901.

The following figures taken from the Austrian *Statistische Monatschrift*, Jan.-Feb., 1902, give the area and production of the chief cereals in Austria in the year 1901 :—

Crops.	Area.	Production.	
		Total.	Average per Acre.
	acres.	bushels.	bushels.
Wheat - - - - -	2,642,231	43,483,550	16·5
Rye- - - - - -	4,472,518	74,542,660	16·7
Barley - - - - -	2,990,619	61,676,307	20·7
Oats - - - - -	4,620,414	101,643,184	22·0
Maize - - - - -	820,388	16,679,674	20·3

PARLIAMENTARY PUBLICATIONS.

Board of Agriculture. Agricultural Returns for 1901. [*Cd.* 1121]. *Price* 1s. 3d.

The statistics collected by the Board of Agriculture of the acreage and produce of crops and the number of live stock in Great Britain in 1901 have been published from time to time as they became available either separately or in the pages of this Journal. They are now brought together for convenient reference and permanent record in the usual annual volume which also comprises a series of tables (numbering 138 in all) giving particulars of the prices of corn and other agricultural produce, the weather of the British Isles, the supply of cattle, sheep and pigs at the principal markets of the country, the imports and exports of agricultural produce, and the latest available information of colonial and foreign agriculture.

In the report which is prefixed to the tables Major Craigie states that the returns of acreage and live stock were compiled from 514,635 schedules representing holdings of more than one acre of land and from 10,985 supplementary returns received from owners of live stock not occupying land or occupying not more than one acre. Resort to estimates was necessary in the case of less than 3 per cent. of the total number of schedules,

The total area of land and water in Great Britain stands at 56,786,000 acres, of which 13,000,000 represent mountain and heath land, used for grazing stock ; 2,726,000 were occupied by woods and plantations, and 32,417,000 were under cultivation. The land under the plough is shown to have fallen in Great Britain from 59 per cent. in the period 1867-71 to 49 per cent. in the period 1897-1901.

The returns of the estimated yield of crops in 1901 show that, although wheat was stated to be nearly a bushel per acre over average, the results of the corn harvest generally were

unsatisfactory. A deficiency in the turnip crop was only partially redeemed by a good yield of mangolds, while the hay crop both from clover and meadows was unusually short. There was, however, a heavy crop of potatoes and a large yield of hops.

The returns of the numbers of live stock are described as disappointing, showing a general diminution in numbers as compared with 1900, except in the case of horses, which increased by 1 per cent.

The prices of corn in 1901 are given in detail for each of the markets scheduled under the Corn Returns Act, 1882, and the averages for England and Wales are tabulated for a long series of years. The price of wheat last year remained unusually steady, but barley and oats showed a slight rise. Major Craigie gives a statement showing the price of wheat in England in six quinquennial periods, side by side with the current price in France and Belgium for the same dates. The available data of the price of meat show that beef realised a lower value in 1901 than in 1900.

The report refers to the tables of imports and exports of agricultural produce, which are given in fuller detail than in previous volumes. The growth and relative magnitude of the imports of dead meat from British possessions and from foreign countries are concisely shown, and a similar comparison is made as regards the supplies of wheat and flour. The total quantity of wheat and flour, expressed as wheat, received last year, slightly exceeded 5,000,000 tons, or more than in any year since 1893, and of this, nearly one-fifth came from British possessions.

The Colonial and Foreign statistics have been extended by the addition of details for Natal and for that part of the Russian Empire known as Northern Caucasia, while in other respects this section of the volume has been made more complete. The result of recent enumerations of live stock in several continental states enables a wider survey to be taken of their present position in regard to animal wealth, and special attention is drawn to the increase of cattle in Russia, excluding Poland, and in Germany. On the other hand the continued decline in the number of sheep, to which

attention has been frequently drawn in previous reports, is again emphasised.

It is stated that the issue of the volume has been somewhat delayed in the hope that the important results of the Agricultural portion of the Twelfth Census of the United States with full official confirmation might be included in the tables, but this was not found possible. The figures for live stock as issued by the Chief Statistician for Agriculture (which are given on page 56 of this Journal), are, however, summarised, although Major Craigie suggests that caution must be exercised, until fuller information is available, in drawing deductions from them and especially in comparing them with the results of previous enquiries.

Board of Agriculture—Annual Report of Proceedings under the Tithe and other Acts for the year 1901. (*Cd.* 1040.) *Price* 2*d.*

The total number of applications to the Board under the various Tithes Acts was 1,142 in 1901, as compared with 994 in 1900. The increase occurred in the two main divisions of the work, namely, altered apportionments and redemptions of tithe rent charge. The total sum paid over for the redemption of tithe rent charges is now shown by the summary of transactions from 1838 to 1901 inclusive, to have exceeded one million sterling. That capital sum, however, represents only £41,141 of apportioned rent charge, being rather more than 1 per cent. of the total rent charge apportioned in England and Wales.

The total number of enfranchisements completed by the Board in 1901 under the Copyhold Act was 293, as compared with 351 in 1900, 220 being under the compulsory and 73 under the voluntary provisions of the Act. The total consideration for these enfranchisements by way of capital payments was £19,290 9s. 10d, and by way of annual rent charges £80 8s. 9d. The amount of the official fees received

in respect of copyhold business during the financial year 1900-1901 was £1,063 5s.

Two redemptions of perpetual rents or annual charges were effected under Section 45 of the Conveyancing and Law of Property Act during the year 1901, making a total of twenty-two transactions under this statute in the twenty years during which it has been in operation.

Under the Inclosure Acts Provisional Orders were confirmed by Parliament for the enclosure of two open fields and the heath and wastes of 610 acres, all in the parish of Sutton, Northants, and the regulation of the common, 826 acres, and the enclosure of the open fields, 321 acres, in the parish of Skipwith, Yorks. (East Riding). Schemes under Part I. of the Commons Act, 1899, for the regulation and management of commons with a view to their conservation as open spaces, were made by the District Councils concerned, and approved by the Board in the following cases: viz., St. Asaph, Langle, Church Green, Woolston and Quantock, Alkerton Green, Broadmoor (Woolhope), Tettenhall Greens, Pilsley Green, Park House Green, Portland Little. Reports were called for in 1901, under Section 28 of the Commons Act, 1876, with respect to field garden and recreation ground allotments set out under the Inclosure Acts. The reports received with regard to field gardens numbered 348; in 277 of these cases the land was let for gardens to persons of the labouring class. The rents for the most part ranged from $1\frac{1}{2}$d. per perch (equal to 20s. per acre) to 3d. per perch (40s. per acre). In several instances rents below $1\frac{1}{2}$d. per perch are taken, but a higher rent than 3d. per perch is rare.

Two schemes under the Metropolitan Commons Act relating respectively to Orpington Commons, Kent, and to Ham Common, Surrey, certified by the Board in 1900, the details of which were published in the last Annual Report, were confirmed by Parliament in the Session of 1901. Orpington Commons are now under the control of the Parish Council, and Ham Common under the control of conservators appointed by the lord of the manor and the Urban District Council of Ham.

One hundred and seventy-six applications under the

Universities and College Estates Acts were received by the Board during the year 1901, for their consent to sales, purchases and exchanges of property, to improvement loans and to other transactions. The number of such applications in 1900 was 130. The securities held by the Board *ex parte* the different universities or colleges, amounted on December 31st, 1901, to £1,002,455 18s. 10d.

Ninety applications were made under the Glebe Lands Act, 1888, for the Board's approval of the sale of 1,754 acres. The sales completed in the past year were 77 in number, comprising 1,393 acres, for which £71,144 was paid. The number of applications under the Drainage and Improvement of Land Acts was 238, and sanction was asked for expenditure amounting to £301,317.

Under Section 21 of the Light Railways Act of 1896 the consent of the Board was given to taking of small portions of certain common lands for the purpose of the Bury and Diss Light Railway in Norfolk and Suffolk, and of the Orpington, Cudham, and Tatsfield Light Railway in the counties of Kent and Surrey. The promoters respectively of the Pwllheli, Nevin, and Porthudinlleyn Light Railway, Carnarvonshire, and of the South Norfolk (Norwich to Loddon) Light Railway, being desirous of obtaining a special advance from the Treasury, applied to the Board for certificates as required by Section 5 (1) of the Light Railways Act. The Board, after due inquiries, were satisfied that the proposed railways would benefit agriculture in their respective districts, but that owing to the exceptional circumstances they would not be constructed without special assistance from the State, and they gave their certificates accordingly.

In 248 cases during the year 1901, as compared with 281 cases in 1900, surveyors nominated by trustees were approved by the Board under Section 26 of the Settled Land Act, 1882. In one case, as compared with four cases in 1900, the Board itself issued, in compliance with the alternative course, a certificate as to the execution of improvements, and the amount properly payable by the trustees of the settlement.

The Agricultural Holdings Act, 1900, which came into operation on January 1st, 1901, effected certain extensions of

the improvements for which an outgoing tenant may claim compensation, simplified the arbitration procedure of the earlier Acts, and enabled all claims as between landlord and tenant with respect to the tenancy, whether under the Act or not, to be settled in one and the same proceeding. Under the new Act, which applies to Scotland as well as to England, umpires were appointed by the Board during the year 1901 in England in seven cases, and single arbitrators in seventeen cases. In Scotland an oversman was appointed in one case and arbiters in five cases. The Board also extended the time for making the award in sixty-three cases in England, and in nine in Scotland. Previous to 1901, under the older Acts in cases arising in England, 213 umpires were appointed.

Brewers' Licences. [*H.C.* 71, 1902.] *Price* 2½*d.*

The number of persons or firms licensed as brewers for sale in the United Kingdom in the year ended 30th September 1901, was 5,968. Of these, 2,905, producing 3,337,464 bulk barrels of beer, used malt only; but among these there was only one large firm. 3,063 brewers used malt and malt substitutes, and produced 33,880,416 bulk barrels of beer. The total quantity of materials used in the production of the 37,217,880 barrels of beer was 56,577,059 bushels of malt, 165,127 bushels of unmalted corn, 1,323,754 cwts. of rice, rice grits, flaked rice or maize, maize grits and similar preparations, 2,858,912 cwts. of sugar (including its equivalent of syrups, glucose, and saccharum). The amount of beer duty charged was £14,052,844.

Agricultural Statistics, Ireland, 1901. *Cd.* 1057. *Price* 1*s.* 5*d.*

This publication contains returns of the prices of certain classes of agricultural products and live stock in Ireland

during the year 1901, with comparative tables for the preceding years since 1882.

The following table gives the average prices of Irish produce for the past three years:—

Commodities.		1899.			1900.			1901.		
		£	s.	d.	£	s.	d.	£	s.	d.
Wheat	per cwt.	0	6	1¾	0	6	4½	0	6	4¾
Oats	„	0	5	2¼	0	5	4¾	0	5	9½
Barley	„	0	6	7¾	0	6	10½	0	7	1
Hay	„	0	2	3¾	0	3	0½	0	2	11
Potatoes	„	0	2	9¼	0	3	4¼	0	3	1
Butter	„	4	15	4	4	15	9¼	4	19	2
Pork	„	1	17	5¾	2	4	9¾	2	8	11¼
Flax	per 14lb.	0	6	5¼	0	7	1	0	6	8¼
Wool	per lb.	0	0	6¾	0	0	6⅞	0	0	5⅝
Eggs	per 120.	0	6	7¾	0	6	7¾	0	6	8
Beef	per cwt.	2	15	1½	2	17	0¼	2	15	3¼
Mutton	„	2	19	6	3	2	10¾	3	0	8½
Cattle, one year old	per head.	6	14	0	6	17	3	6	17	2
Two „	„	9	2	1	9	12	10	9	13	2
Three „	„	11	9	4	12	3	4	12	6	3
Springers	„	12	17	2	13	5	8	13	10	9
Lambs	„	1	4	4	1	4	3	1	2	7
Sheep over 12 and under 24 months old	„	1	13	3	1	14	8	1	13	11
„ Two years old and over	„	1	15	2	1	16	6	1	15	0

LIVE WEIGHT PRICES OF CATTLE.

The returns received from the twenty-one places scheduled under the Markets and Fairs (Weighing of Cattle) Act, 1891, show that during the first quarter of 1902 the number of cattle and sheep entering these markets was somewhat larger than in the corresponding period of 1901, whilst that of pigs was practically the same:—

Animals.	1st Quarter, 1902.	1st Quarter, 1901.
	No.	No.
CATTLE:		
Entering markets	278,534	271,825
Weighed	43,379	38,459
Prices returned	35,217	32,837
Prices returned with quality distinguished	29,764	27,397
SHEEP:		
Entering markets	759,637	724,286
Weighed	9,023	9,218
Prices returned with quality distinguished	8,099	8,168
SWINE:		
Entering markets	109,271	109,336
Weighed	371	483
Prices returned with quality distinguished	337	483

The number of cattle weighed reached 15·57 per cent. of the total number returned, being a higher proportion than in any previous quarter, while the percentage for which prices in conjunction with weight were available was 10·69, which also slightly exceeds any preceding record.

At three places (Birmingham, Bristol and York) the weighbridge appears to have been entirely unused during the three months, while at two other places (Ashford and Salford), although a certain number of animals were weighed, no information as to the prices realised for them was supplied. The average prices at the thirteen markets, from which sufficient

data for the calculation of an average for fat cattle were forthcoming, were as under :—

PLACES.	Inferior or Third Quality.			Good or Second Quality.			Prime or First Quality.		
	Number.	Price per Stone	Price per Cwt.	Number	Price per Stone	Price per Cwt.	Number.	Price per Stone	Price per Cwt.
		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.
Carlisle	843	3 5¼	27 6	600	3 10¼	30 10	1,691	4 3¼	34 2
Leicester	—	—	—	43	3 8¼	29 6	152	4 6	36 0
Leeds	—	—	—	93	3 7	28 8	408	4 4¼	34 10
Liverpool	276	3 5¼	27 6	341	3 11	31 4	1,606	4 4	34 8
London	5	3 6½	28 4	319	4 5	35 4	1,185	4 10¾	39 2
Newcastle	—	—	—	137	4 2¾	33 10	773	4 7¾	37 2
Shrewsbury	163	3 7¼	28 10	245	4 0	32 0	189	4 4½	35 0
Aberdeen	1,768	3 2½	25 8	1,997	4 3¼	34 2	2,888	4 7	36 8
Dundee	601	3 2	25 4	1,302	4 3¾	34 6	601	4 8½	37 8
Edinburgh	—	—	—	3,162	4 5½	35 8	190	4 8¼	37 6
Falkirk	263	4 0½	32 4	349	4 4¼	34 10	309	4 7¼	36 10
Glasgow	257	4 3	34 0	617	4 4½	35 0	2,123	4 6¼	36 2
Perth	37	3 11¼	31 6	401	4 3½	34 4	215	4 7¼	36 10

By combining the returns from the thirteen markets above specified it is possible to give a general indication, month by month to the end of May, of the prevailing live weight prices of cattle during the present as compared with the preceding year :—

Months.	Prime or First Quality.					
	England.		Scotland.		Great Britain.	
	1902.	1901.	1902.	1901.	1902.	1901.
	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.
January	35 10	35 10	36 6	36 6	36 2	36 2
February	36 0	35 6	36 8	36 0	36 4	35 10
March	35 10	35 10	36 8	36 2	36 4	36 0
April	37 6	35 6	37 8	36 4	37 8	36 0
May	39 8	35 8	39 6	36 2	39 8	36 0

At only eight of the scheduled markets were sales of fat cattle by live weight—*i.e.*, at an agreed rate per stone or per cwt.—reported during the three months ending March 31. The number of animals thus sold was 3,046 and of these transactions one-half were reported from Glasgow.

A certain number of store cattle were reported to have been weighed during the three months, and prices were furnished in respect of 3,054. Five-sixths of these were returned from Shrewsbury, where the practice of subjecting store cattle to the test of the scales has for some time prevailed. At Edinburgh 304 store cattle were returned as weighed, with the prices given, and of these 264 were reported to have been actually sold by live weight at an average price of 31s. per cwt At Glasgow and Norwich also a few store cattle were returned as sold by live weight during the quarter.

The usual table for the quarter is appended :—

CATTLE, SHEEP, AND SWINE, *entering the Markets and Marts of the undermentioned Places, with the Number Weighed, as received from the Market Authorities, in the* FIRST QUARTER *of* **1902**, *under the Markets and Fairs (Weighing of Cattle) Act*, 1891 (54 *and* 55 *Vict. c.* 70).

PLACES.	Cattle. Total Number entering the Markets or Marts.	Cattle. Number Weighed.	Cattle. Number Weigh'd for which Prices were given.	Sheep. Total Number entering the Markets or Marts.	Sheep. Number Weighed.	Sheep. Number Weigh'd for which Prices were given.	Swine. Total Number entering the Markets or Marts.	Swine. Number Weighed.	Swine. Number Weigh'd for which Prices were given.
ENGLAND.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Ashford	2,145	63	—	10,480	—	—	5,273	—	—
Birmingham	6,496	—	—	9,757	—	—	56,251	—	—
Bristol	10,139	—	—	18,471	—	—	—	—	—
Carlisle	9,301	3,134	3,134	35,989	—	—	3,552	—	—
Leicester	11,737	298	241	11,228	—	—	1,861	33	—
Leeds	8,558	501	501	28,945	859	859	6	—	—
Lincoln	1,958	—	—	17,811	—	—	3,318	18	18
Liverpool	17,078	2,223	2,223	54,042	165	165	64	—	—
London	18,385	4,485	1,509	122,530	888	—	845	—	—
Newcastle-upon-Tyne	24,732	910	910	67,816	—	—	9,657	246	246
Norwich	20,499	45	38	40,703	—	—	4,189	1	—
Salford	33,843	1,152	—	108,595	—	—	723	—	—
Shrewsbury	14,811	5,147	3,117	7,053	—	—	8,797	—	—
Wakefield	16,271	1,700	531	43,490	—	—	2,985	—	—
York	15,826	—	—	12,034	—	—	1,843	—	—
SCOTLAND.									
Aberdeen	12,801	6,821	6,821	10,907	5,616	5,616	3,222	—	—
Dundee	4,263	2,518	2,508	6,265	1,033	1,033	634	—	—
Edinburgh	15,769	7,103	*3,656	44,382	20	—	2,309	—	—
Falkirk	2,162	921	921	2,193	—	—	15	—	—
Glasgow	21,042	3,699	3,001	72,057	181	165	1,083	—	—
Perth	10,718	2,659	*653	34,889	261	261	2,644	73	73
TOTAL for ENGLAND	211,779	19,658	12,204	588,944	1,912	1,024	99,364	298	264
TOTAL for SCOTLAND	66,755	23,721	*17,560	170,693	7,111	7,075	9,907	73	73
Total	278,534	43,379	*29,764	759,637	9,023	8,099	109,271	371	337

* Prices for 3,447 cattle in addition to the above were quoted from Edinburgh, and for 2,006 cattle from Perth, but without distinguishing the quality.

PRICES OF MEAT, CORN, AND DAIRY PRODUCE.

AVERAGE PRICES of DEAD MEAT, per 8 lbs., at the LONDON CENTRAL MEAT MARKET, during the First Quarter of 1902, and during the Months of March, April, and May, 1902.

(*Compiled from the prices quoted weekly in the "Meat Trades' Journal."*)

DESCRIPTION.	1st QUARTER 1902.	MARCH 1902.	APRIL 1902.	MAY 1902.
BEEF :—	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Scotch, short sides	4 3 to 4 6	4 3 to 4 6	4 6 to 4 9	4 7 to 4 11
,, long sides	4 0 ,, 4 2	4 0 ,, 4 2	4 2 ,, 4 4	4 5 ,, 4 7
English	3 10 ,, 4 1	3 10 ,, 4 0	4 1 ,, 4 3	4 4 ,, 4 7
Cows and Bulls	1 11 ,, 3 3	2 0 ,, 3 3	2 3 ,, 3 5	2 4 ,, 3 6
American Birkenhead killed	3 8 ,, 3 11	3 7 ,, 3 9	4 1 ,, 4 2	4 3 ,, 4 5
,, Deptford killed	3 9 ,, 4 0	3 8 ,, 3 11	4 1 ,, 4 3	4 3 ,, 4 6
American Refrig. hind-quarters	3 11 ,, 4 3	3 10 ,, 4 2	4 4 ,, 4 6	4 4 ,, 4 7
,, ,, fore-quarters	2 7 ,, 2 10	2 7 ,, 2 10	3 1 ,, 3 3	3 3 ,, 3 6
Australian, Frozen hind-quarters	2 1 ,, 2 3	2 3 ,, —	2 9 ,, 3 0	— ,, —
,, ,, fore-quarters	1 9 ,, 1 10	2 0 ,, —	2 7 ,, —	— ,, —
New Zealand ,, hind-quarters	2 10 ,, 3 0	2 8 ,, 2 11	3 3 ,, 3 4	3 6 ,, 3 7
,, ,, fore-quarters	2 0 ,, 2 1	2 2 ,, —	2 8 ,, 2 9	3 1 ,, —
River Plate ,, hind-quarters	2 3 ,, 2 5	2 5 ,, 2 6	2 8 ,, —	3 5 ,, —
,, ,, fore-quarters	1 11 ,, —	2 1 ,, —	2 5 ,, 2 6	3 0 ,, —
MUTTON :—				
Scotch	4 0 ,, 4 6	4 3 ,, 4 7	4 4 ,, 4 8	4 10 ,, 5 4
English	3 10 ,, 4 5	4 1 ,, 4 6	4 3 ,, 4 7	4 8 ,, 5 1
Ewes	2 11 ,, 3 5	3 3 ,, 3 10	3 6 ,, 3 10	3 7 ,, 4 1
Continental	3 9 ,, 4 1	4 1 ,, 4 4	4 0 ,, 4 3	4 5 ,, 4 8
New Zealand, Frozen	2 0 ,, 2 7	2 0 ,, 2 7	2 3 ,, 2 8	2 5 ,, 3 0
Australian, Frozen	2 0 ,, 2 1	1 11 ,, 2 1	2 2 ,, 2 3	2 6 ,, —
River Plate, Frozen	2 0 ,, 2 2	2 0 ,, 2 2	2 3 ,, —	2 6 ,, 2 7
LAMB :—				
English	6 6 ,, 7 10	6 6 ,, 7 10	6 5 ,, 7 8	5 5 ,, 6 9
New Zealand, Frozen	3 6 ,, 3 9	3 6 ,, 3 9	3 5 ,, 3 8	3 2 ,, 3 5
VEAL :—				
Best	4 8 ,, 5 2	4 9 ,, 5 5	4 9 ,, 5 1	4 5 ,, 4 10
Secondary and middling	3 10 ,, 4 6	4 1 ,, 4 8	4 2 ,, 4 6	3 8 ,, 4 4
PORK :—				
English, best	4 3 ,, 4 8	4 4 ,, 4 9	4 6 ,, 4 11	4 6 ,, 4 10
,, seconds and thirds	3 6 ,, 4 0	3 6 ,, 4 1	3 6 ,, 4 0	3 8 ,, 4 2

AVERAGE WHOLESALE PRICES of CATTLE and SHEEP, per 8 lbs., sinking the offal, at the METROPOLITAN CATTLE MARKET, during the under-mentioned Quarters of 1901 and 1902.

PERIOD.	CATTLE.			SHEEP.		
	Inferior.	Second.	First.	Inferior.	Second.	First.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1st Quarter, 1901	2 4	3 11	4 7	3 4	5 2	6 0
2nd Quarter ,,	2 4	3 11	4 6	3 3	4 9	5 7
3rd Quarter ,,	2 4	4 0	4 7	3 2	4 9	5 7
4th Quarter ,,	2 5	4 0	4 9	3 2	4 10	5 7
1st Quarter, 1902	2 7	3 11	4 8	3 6	4 10	5 6

AVERAGE WHOLESALE PRICES OF BEEF and MUTTON, per 8 lbs., by the Carcase, at LIVERPOOL and GLASGOW, during the under-mentioned Quarters of 1901 and 1902.

PERIOD.	LIVERPOOL.*		GLASGOW.†	
	BEEF.	MUTTON.	BEEF.	MUTTON.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
1st Quarter, 1901	2 8 to 3 11	3 6 to 5 4	3 0 to 3 10	4 4 to 5 4
2nd Quarter, ,,	2 10 ,, 3 8	4 8 ,, 5 8	3 4 ,, 3 10	4 2 ,, 5 2
3rd Quarter, ,,	3 0 ,, 3 11	3 8 ,, 5 0	3 0 ,, 3 10	3 8 ,, 4 8
4th Quarter, ,,	2 4 ,, 4 0	3 4 ,, 4 10	3 0 ,, 3 10	3 0 ,, 4 4
1st Quarter, 1902	2 6 ,, 4 0	3 4 ,, 5 4	4 4 ,, 4 10	5 0 ,, 5 10

* Compiled from information furnished by the Medical Officer of Health, Liverpool. The prices quoted are for Carcases of Animals *slaughtered at the Liverpool Abattoir.* and do not apply to Imported Meat.

† Compiled from information furnished by the Principal of the Veterinary College, Glasgow.

BERLIN MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Dead Weight) in the BERLIN CATTLE MARKET in the undermentioned Months of 1902.

MONTHS.	OXEN.		SHEEP.		SWINE.	
	Per Cwt.		Per Cwt.		Per Cwt.	
1902.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
February - - -	58	10	50	11	61	3
March - - - -	58	3	52	9	60	3
April - - - -	58	8	52	11	59	4

NOTE.—The above prices are compiled from the Wholesale Prices quoted in the *Monatliche Nachweise über den Auswärtigen Handel des deutschen Zollgebiets.* The prices for swine are live weight prices with 20 per cent. tare.

PARIS MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Medium Quality, Dead Weight), per cwt., in the PARIS CATTLE MARKET in the undermentioned Months of 1902.

MONTHS.	OXEN.		CALVES.		SHEEP.		PIGS.	
	Per Cwt.		Per Cwt.		Per Cwt.		Per Cwt.	
1902.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
March - - - -	48	10	64	4	69	8	57	7
April - - - -	47	10	75	10	69	3	59	7
May - - - -	48	4	79	5	74	4	60	9

NOTE.—The above prices have been compiled from the weekly returns published in the *Journal d'Agriculture Pratique.*

CHICAGO.

AVERAGE PRICES of CATTLE at CHICAGO per Cwt. (Live Weight) in the under-mentioned Months of 1902.

Month.	Good Dressed Beef and Shipping Steers.					Export Cattle.					Extra Prime Cattle.				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.
March - -	27	1	to	30	11	27	9	to	32	9	33	4	to	34	1
April - -	29	10	,,	32	3	29	10	,,	33	6	33	11	,,	34	11
May - - -	30	7	,,	33	3	30	3	,,	34	5	34	5	,,	35	8

Compiled from the Live Stock Reports issued by Messrs. Clay, Robinson, and Co., of the Union Stock Yards, Chicago, Illinois.

AVERAGE VALUES, per Cwt., of various Kinds of DEAD MEAT Imported into the United Kingdom from FOREIGN COUNTRIES and BRITISH POSSESSIONS in the under-mentioned Quarters of 1901 and 1902.

(*Computed from the Trade and Navigation Accounts.*)

PERIOD.	BEEF.				MUTTON.		PORK.				BACON.		HAMS.	
	Fresh.		Salted.		Fresh.		Fresh.		Salted.					
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1st Quarter, 1901 -	40	9	25	8	37	9	43	2	27	10	45	1	46	8
2nd Quarter, ,, -	39	5	25	10	36	6	43	8	25	7	47	3	47	7
3rd Quarter, ,, -	39	4	26	3	37	2	43	5	24	4	46	9	49	11
4th Quarter ,, -	38	9	27	1	34	11	43	4	27	7	49	3	50	2
1st Quarter, 1902 -	40	3	28	8	35	1	43	3	31	6	47	8	48	3

AVERAGE PRICES of **British Corn** per Quarter of 8 imperial bushels,* computed from the Weekly Averages of Corn Returns from the Returning Markets of ENGLAND AND WALES, pursuant to the Corn Returns Act, 1882, together with the QUANTITIES returned as sold at such Markets, in the under-noted periods of the Years 1902, 1901, and 1900.

QUARTER ENDED	PRICES.			QUANTITIES.		
	1902.	1901.	1900.	1902.	1901.	1900.
Wheat.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day - - -	27 3	26 3	25 11	826,065	744,018	868,378
Midsummer - - -	—	27 1	25 9	—	547,737	854,497
Michaelmas - - -	—	26 11	28 7	—	535,109	511,347
Christmas - - -	—	26 7	27 4	—	778,686	689,261
Barley.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day - - -	26 8	25 3	25 1	669,250	844,616	888,949
Midsummer - - -	—	24 9	24 3	—	53,408	93,157
Michaelmas - - -	—	24 0	24 5	—	236,164	143,552
Christmas - - -	—	26 8	25 11	—	2,235,441	2,065,135
Oats.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day - - -	20 3	17 6	16 7	239,048	236,316	246,949
Midsummer - - -	—	19 3	18 2	—	81,172	110,163
Michaelmas - - -	—	18 7	18 7	—	131,023	116,880
Christmas - - -	—	18 4	17 0	—	265,703	237,791

* Section 8 of the Corn Returns Act, 1882, provides that where returns of purchases of British Corn are made to the local inspector of Corn Returns in any other measure than the imperial bushel or by weight or by a weighed measure, that officer shall convert such returns into the imperial bushel, and in the case of weight or weighed measure the conversion is to be made at the rate of 60 imperial pounds for every bushel of wheat, 50 imperial pounds for every bushel of barley, and 39 imperial pounds for every bushel of oats.

AVERAGE PRICES of **British Corn** per Quarter of 8 imperial bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1902, and in the corresponding Weeks in 1901 and 1900.

Weeks ended (*in 1902*).	**Wheat.**			**Barley.**			**Oats.**		
	1902.	1901.	1900.	1902.	1901.	1900.	1902.	1901.	1900.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 4 -	27 7	26 5	25 9	26 7	25 4	25 7	19 10	17 2	16 2
,, 11 -	27 8	26 7	25 11	26 7	25 6	25 5	20 0	17 3	16 3
,, 18 -	27 8	26 11	26 0	26 11	25 9	25 8	20 0	17 3	16 2
,, 25 -	27 7	26 10	25 10	26 7	25 6	25 9	20 3	17 6	16 4
Feb. 1 -	27 4	26 7	25 8	26 7	25 7	25 4	20 2	17 8	16 6
,, 8 -	27 2	26 8	25 10	26 9	25 7	25 3	20 3	17 7	16 5
,, 15 -	26 11	26 4	26 1	27 5	25 4	24 11	20 3	17 7	16 8
,, 22 -	27 1	26 1	26 3	26 11	25 0	25 1	20 4	17 7	16 9
Mar. 1 -	27 1	25 11	26 4	26 8	25 0	24 6	20 5	17 9	16 10
,, 8 -	27 0	25 9	25 11	26 8	25 4	24 8	20 5	17 7	16 11
,, 15 -	27 1	25 9	25 10	26 6	25 1	24 6	20 6	17 7	16 11
,, 22 -	27 1	25 8	25 11	26 4	24 11	25 0	20 6	17 9	17 1
,, 29 -	27 2	26 0	25 10	27 2	24 9	24 11	20 7	18 0	17 2
Apl. 5 -	27 3	26 3	25 10	26 5	25 3	24 10	20 6	18 0	17 2
,, 12 -	27 5	26 5	25 11	26 7	26 0	24 5	21 0	18 1	17 8
,, 19 -	27 7	26 8	26 0	27 1	25 7	24 9	21 1	18 8	17 3
,, 26 -	28 9	26 8	26 0	26 5	25 8	25 2	21 6	18 8	17 11
May 3 -	29 9	26 9	25 11	27 5	26 4	25 3	21 10	19 1	18 0
,, 10 -	30 9	27 3	25 11	26 10	26 2	24 10	22 6	19 1	17 11
,, 17 -	31 1	27 7	25 7	25 3	24 2	24 5	22 5	19 4	18 5
,, 24 -	31 6	27 7	25 5	25 4	24 1	23 11	22 6	19 8	18 2
,, 31 -	31 6	27 7	25 5	25 1	23 8	24 4	22 10	19 9	18 6
June 7 -	31 3	27 6	25 3	24 3	22 9	23 8	22 11	20 1	18 8
,, 14 -	30 11	27 8	25 6	23 8	24 0	23 8	22 8	19 7	18 11
,, 21 -		27 6	25 9		23 2	23 5		20 3	18 11
,, 28 -		27 6	26 11		25 4	23 4		20 0	19 3
July 5 -		27 8	27 10		21 9	22 10		19 10	19 5
,, 12 -		27 2	28 7		23 10	23 2		19 9	19 1
,, 19 -		27 3	29 0		23 4	23 8		19 11	19 3
,, 26 -		27 3	29 3		22 1	24 4		19 4	19 9
Aug. 2 -		27 6	28 10		23 1	23 10		20 0	19 4
,, 9 -		27 7	28 7		22 1	23 7		19 4	19 8
,, 16 -		27 4	28 10		27 2	23 3		18 9	19 11
,, 23 -		27 3	28 10		23 7	24 10		18 1	18 8
,, 30 -		27 0	28 8		24 3	25 2		17 10	18 1
Sept. 6 -		26 5	28 7		25 1	25 8		17 6	17 10
,, 13 -		26 2	28 4		24 11	25 4		17 4	17 1
,, 20 -		26 0	28 4		25 5	26 0		17 4	17 1
,, 27 -		25 10	28 9		25 10	26 1		17 2	17 2
Oct. 4 -		25 8	28 9		26 3	26 2		17 7	16 10
,, 11 -		25 9	28 9		26 5	26 2		17 6	17 1
,, 18 -		25 10	28 4		26 8	26 5		17 8	16 11
,, 25 -		25 11	27 11		26 10	26 3		17 5	16 11
Nov. 1 -		26 2	27 5		26 10	26 3		17 7	16 11
,, 8 -		26 6	27 3		27 0	25 11		17 8	16 10
,, 15 -		26 9	27 1		26 9	25 8		18 3	17 1
,, 22 -		27 1	27 2		26 10	25 10		18 7	17 0
,, 29 -		27 1	27 0		26 9	25 9		18 9	17 2
Dec. 6 -		27 1	26 10		26 7	25 11		19 0	17 4
,, 13 -		27 2	26 9		26 8	25 7		19 3	17 1
,, 20 -		27 7	26 7		26 8	25 7		19 8	17 2
,, 27 -		27 7	26 4		26 8	25 10		19 10	17 2

AVERAGE PRICES of WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER in BELGIUM in the under-mentioned Months of 1902.

Month.	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.
February, 1902 - - - -	28	5	23	3	20	11
March ,, - - - -	28	5	23	7	21	3
April ,, - - - -	28	7	23	11	21	9

The above prices have been compiled from the official monthly averages published in the *Moniteur Belge*.

AVERAGE PRICES of WHEAT, BARLEY, and OATS per IMPERIAL QUARTER in FRANCE, and ENGLAND and WALES, in the under-mentioned Months of 1902.

MONTH.	FRANCE.		ENGLAND.	
WHEAT.				
1902.	Per Qr.		Per Qr.	
	s.	d.	s.	d.
March - - - - - -	36	6	27	1
April - - - - - -	36	9	27	9
May - - - - - - -	36	10	30	11
BARLEY.				
1902.	Per Qr.		Per Qr.	
	s.	d.	s.	d.
March - - - - -	23	5	26	8
April - - - - -	23	6	26	7
May - - - - - - -	23	7	25	11
OATS.				
1902.	Per Qr.		Per Qr.	
	s.	d.	s.	d.
March - - - - - -	23	3	20	5
April - - - - - -	23	5	21	0
May - - - -	23	3	22	5

Note.—The prices of French grain have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*. The prices of British grain are official averages based on the weekly returns furnished under the Corn Returns Act, 1882.

AVERAGE PRICES of WHEAT, BARLEY, and OATS per IMPERIAL QUARTER at LONDON, PARIS and BERLIN in the under-mentioned Months of 1902.

Month.	London.	Paris.	Berlin.
	WHEAT.		
	Per Qr. s. d.	Per Qr. s. d.	Per Qr. s. d.
February, 1902 - - - -	28 0	37 4	37 3
March, ,, - - - - -	27 11	36 0	36 10
April, ,, - - - - -	28 10	37 5	36 5
May, ,, - - - - -	31 10	37 10	—
	BARLEY.		
	Per Qr. s. d.	Per Qr. s. d.	Per Qr. s. d.
February, 1902 - - - -	29 6	23 8	22 10*
March, ,, - - - - -	26 8	23 9	22 10*
April, ,, - - - - -	27 0	24 0	22 10*
May, ,, - - - - -	25 1	23 9	—
	OATS.		
	Per Qr. s. d.	Per Qr. s. d.	Per Qr. s. d.
February, 1902 - - - -	21 0	24 8	22 5
March, ,, - - - -	21 2	24 11	22 2
April, ,, - - - - -	21 6	24 5	22 3
May, ,, - - - - -	22 9	23 9	—

Note.—The London quotations represent the price of British corn as returned under the Corn Returns Act, 1882; the prices of grain in Paris have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the quotations for Berlin are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des deutschen Zollgebiets.*

* Prices at Breslau; no quotations for Berlin.

PRICES OF WOOL.

AVERAGE PRICES of ENGLISH WOOL, per pack of 240 lbs., in the under-mentioned Months of 1902.

(Compiled from the "Economist.")

DESCRIPTION.	March, 1902.	April, 1902.	May, 1902.
	£ s. £ s.	£ s. £ s.	£ s. £ s.
South Down - -	7 0 to 8 10	7 0 to 8 10	7 0 to 8 10
Half-breds - - -	5 0 ,, 6 16	5 0 ,, 7 0	5 0 ,, 7 0
Leicester - - -	5 0 ,, 5 10	5 0 ,, 5 10	5 0 ,, 5 10
Kent Fleeces - -	5 0 ,, 6 0	5 0 ,, 6 0	5 0 ,, 6 0

AVERAGE WHOLESALE PRICES of BUTTER, MARGARINE, and CHEESE in the under-mentioned Months of 1902.

(Compiled from the "Grocer.")

DESCRIPTION.	March, 1902.				April, 1902.				May, 1902.			
	Per Cwt.				Per Cwt.				Per Cwt.			
BUTTER :	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Cork, 1sts - -	111	0	—		103	0	—		92	0	—	
,, 2nds - -	102	0	—		99	0	—		89	0	—	
,, 3rds - -	99	0	—		97	0	—		88	0	—	
,, 4ths - -	75	0	—		79	0	—		80	0	—	
Irish Creamery * -	107	0 to	111	0	100	0 to	103	0	94	1 to	96	8
Friesland - -	103	0 ,,	104	0	100	0 ,,	102	0	95	0 ,,	98	0
Dutch Creameries -	108	0 ,,	109	0	102	0 ,,	104	0	96	0 ,,	100	0
French Baskets -	110	0 ,,	116	0	102	0 ,,	108	0	96	0 ,,	102	0
,, Crocks and Firkins -	100	0 ,,	106	0	93	0 ,,	98	0	88	0 ,,	92	0
,, 2nds and 3rds	86	0 ,,	96	0	85	0 ,,	89	0	81	0 ,,	84	0
Danish and Swedish -	111	0 ,,	113	0	110	0 ,,	113	0	104	0 ,,	107	0
Finnish - -	102	0 ,,	108	0	99	0 ,,	106	0	96	0 ,,	100	0
Russian and Siberian	96	0 ,,	104	0	93	0 ,,	103	0	86	0 ,,	96	0
Argentine - -	108	0 ,,	110	0	103	0 ,,	107	0	100	0 ,,	103	0
Canadian and States -	96	0 ,,	104	0	—		—		—		—	
Colonial, fine- -	98	0 ,,	110	0	97	0 ,,	108	0	92	0 ,,	104	0
,, good and inferior -	80	0 ,,	96	0	80	0 ,,	93	0	80	0 ,,	90	0
Fresh Rolls (Foreign) per doz. - -	11	0 ,,	15	0	10	6 ,,	13	7	10	2 ,,	12	11
MARGARINE - -	38	0 ,,	58	0	38	0 ,,	56	0	38	0 ,,	59	0
CHEESE :												
Cheddar - -	57	0 ,,	73	0	57	0 ,,	74	0	60	0 ,,	74	0
,, Loaf -	71	0 ,,	73	0	72	0 ,,	74	0	71	0 ,,	73	0
Wiltshire, Loaf -	70	0 ,,	72	0	70	0 ,,	72	0	70	0 ,,	72	0
Double Gloucester -	62	0 ,,	64	0	62	0 ,,	66	0	62	0 ,,	66	0
Derby, Factory -	65	0 ,,	66	0	66	0 ,,	68	0	65	0 ,,	67	0

* These prices are the averages of the official quotations of the Price Committee of the Irish Co-operative Agency at Limerick for the choicest Irish pure creamery butter.

WEEKLY PRICES (WHOLESALE) of VEGETABLES and FRUIT at COVENT GARDEN MARKET in each week of May, 1902.

(Compiled from the "Gardeners' Chronicle.")

Description.	Week ending May 3rd.	May 10th.	May 17th.	May 24th.	May 31st.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
VEGETABLES—					
Artichokes, Globe, per doz.	1 6 to 2 0	3 0 —	3 0 to 4 0	3 0 to 4 0	2 6 to 3 0
Asparagus, English, per bundle	1 3 ,, 5 0	1 3 to 5 0	1 3 ,, 5 0	1 3 ,, 5 0	1 0 ,, 4 0
Beans, Channel Islands, per lb.	— —	— —	1 0 —	0 10 —	0 10 -
Beetroots, per bushel	3 0 ,, 3 6	3 0 —	3 0 ,, 3 6	3 0 ,, 3 6	3 0 ,, 3 6
Cabbage, per tally	4 0 ,, 5 0	4 0 ,, 6 0	4 0 ,, 6 0	4 0 ,, 6 0	2 0 ,, 4 0
Carrots, per dozen bunches	2 6 ,, 3 6	2 6 ,, 3 6	3 6 ,, 4 6	3 6 ,, 4 6	4 6 —
,, washed, per bag	4 0 ,, 4 6	5 6 —	7 0 ,, 7 6	7 6 ,, 8 0	— —
Cauliflowers, per dozen	2 0 ,, 2 6	— —	— —	— —	— —
Cress, per dozen punnets	1 3 —	1 3 —	1 3 —	1 3 —	1 3 —
Cucumbers, per doz.	2 0 ,, 3 3	2 0 ,, 3 6	2 0 ,, 2 6	2 0 ,, 3 0	2 0 ,, 3 0
Garlic, per lb.	0 3 —	0 3 —	0 3 —	0 3 —	0 3 —
Leeks, per doz. bunches	2 0 —	2 0 ,, 2 6	2 6 —	2 0 ,, 2 6	2 0 ,, 2 6
Lettuces, Cabbage, per doz.	0 6 ,, 1 0	0 4 ,, 1 0	0 4 ,, 1 0	0 6 ,, 1 0	0 6 ,, 1 0
Lettuces Cos., per doz.	2 6 ,, 3 6	2 6 ,, 3 6	2 6 ,, 3 0	2 6 ,, 3 6	2 6 ,, 3 6
Mint, new, per bunch	0 4 —	0 3 ,, 0 4	0 3 —	0 3 —	0 2 ,, 0 3
Mushrooms, House, per lb.	0 10 —	0 9 —	0 8 ,, 0 10	0 9 —	0 8 ,, 0 9
Onions, picklers, per sieve	4 0 —	4 0 —	4 0 ,, 5 0	4 0 ,, 5 0	4 0 ,, 5 0
Parsley, per dozen bunches	4 0 ,, 6 0	3 0 ,, 4 0	3 0 ,, 4 0	4 0 ,, 5 0	4 0 ,, 5 0
Peas, in 1 lb. bags	0 5 —	0 5 —	— —	— —	— —
,, ,, flats	6 0 —	6 0 —	4 0 ,, 5 0	3 6 ,, 4 0	4 0 ,, 5 0
Potatoes, per ton	40 0 ,, 85 0	40 0 ,, 85 0	40 0 ,, 85 0	60 0 ,, 90 0	60 0 ,, 90 0
,, new, per cwt.	11 0 —	10 0 ,, 12 0	9 0 ,, 12 0	9 0 ,, 12 0	8 0 ,, 9 0
Radishes, per doz. bunches	0 3 ,, 0 6	0 3 ,, 1 0	0 3 ,, 1 0	0 3 ,, 1 0	0 3 ,, 1 0
Rhubarb, Out-of-doors, per doz. bundles	1 0 ,, 2 6	1 0 ,, 2 6	1 0 ,, 2 6	1 6 ,, 2 6	1 6 ,, 2 0
Salad, small, per doz. punnets	1 3 —	1 3 —	1 3 —	1 3 —	1 3 —
Shallots, per lb.	0 2 —	0 2 —	0 2 —	0 2 —	0 2 —
Spinach, English, per bushel	2 0 ,, 2 6	2 0 ,, 2 6	2 0 ,, 2 6	2 0 ,, 2 6	1 0 ,, 1 6
Tomatoes, English, per lb.	0 10 ,, 1 2	0 10 —	0 8 ,, 0 10	0 8 —	0 6 ,, 0 6½
Turnips, per dozen bunches	2 0 —	2 6 —	2 6 —	— —	— —
,, new French, per bunch	0 8 ,, 0 10	0 10 ,, 1 0	0 8 ,, 0 10	0 8 ,, 0 10	— —
Turnips, new French, per doz.	— —	— —	— —	— —	2 0 ,, 4 0
Watercress, per dozen bunches	0 4 ,, 0 6	0 4 ,, 0 6	0 4 ,, 0 6	0 4 ,, 0 6	0 4 ,, 0 6
FRUIT—					
Cherries, per box	1 3 —	2 0 —	1 0 ,, 2 6	1 6 ,, 2 0	1 0 ,, 1 6
Grapes, Muscats, per lb.	8 0 ,, 12 0	4 0 ,, 8 0	2 0 ,, 6 0	2 0 ,, 5 0	2 0 ,, 5 0
,, New Hamburg, per lb.	2 6 ,, 6 0	2 0 ,, 5 0	2 0 ,, 4 0	1 6 ,, 4 0	1 6 ,, 4 0
Peaches, per dozen	18 0 ,, 24 0	6 0 ,, 36 0	6 0 ,, 24 0	3 0 ,, 18 0	2 0 ,, 15 0
Pines, each	3 0 ,, 4 0	2 0 ,, 4 0	3 0 ,, 4 0	3 0 ,, 4 0	3 0 ,, 4 0
Strawberries, Class A, per lb.	3 0 ,, 4 0	3 0 ,, 4 0	3 0 ,, 4 0	3 0 ,, 4 0	2 6 ,, 3 0
,, Class B, per lb.	1 0 ,, 2 9	1 0 ,, 2 0	1 6 ,, 2 0	1 0 ,, 1 6	1 0 ,, 1 6

DISEASES OF ANIMALS IN GREAT BRITAIN.

NUMBER of OUTBREAKS of **Foot-and-Mouth Disease** and of **Swine-Fever**, with the Number of SWINE Slaughtered by order of the Board of Agriculture, in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Foot-and-Mouth Disease.		Swine-Fever.	
	OUTBREAKS Confirmed.	ANIMALS Attacked.	OUTBREAKS Confirmed.	SWINE Slaughtered as Diseased, or as having been exposed to Infection.
	No.	*No.*	*No.*	*No.*
September, 1900 - - -	7	102	409	2,622
December, 1900 - - -	5	41	357	2,731
March, 1901 - - -	10	652	625	3,165
June, 1901 - - -	2	17	1,490	7,066
September, 1901 - - -	—	—	680	3,391
December, 1901 - - -	—	—	345	1,615
March, 1902 - - -	1	30	399	2,122

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax** and **Glanders** in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Anthrax.		Glanders (including **Farcy**).	
	OUTBREAKS Reported.	ANIMALS Attacked.	OUTBREAKS Reported.	ANIMALS Attacked.
	No.	*No.*	*No.*	*No.*
September, 1900 - -	109	224	315	474
December, 1900 - -	159	240	259	437
March, 1901 - -	163	223	322	571
June, 1901 - -	193	281	327	551
September, 1901 - -	114	165	398	677
December, 1901 - -	181	302	300	571
March, 1902 - -	202	357	285	543

NUMBER OF CASES of **Rabies** in DOGS in GREAT BRITAIN in each of the under-mentioned periods.

THREE MONTHS ENDED	Number of Cases.
30th September, 1900 - - - -	3
31st December, 1900 - - - -	3
31st March, 1901 - - - - -	1
30th June, 1901 - - - - -	—
30th September, 1901 - - - -	—
31st December, 1901 - - - -	—
31st March, 1902 - - - - -	8

DISEASES OF ANIMALS IN IRELAND.

NUMBER of OUTBREAKS of **Pleuro-Pneumonia** and of **Swine-Fever**, with the Number of CATTLE and SWINE Slaughtered by order of the Department of Agriculture and Technical Instruction in IRELAND, in each of the undermentioned periods.

QUARTER ENDED	Pleuro-Pneumonia.			Swine-Fever.	
	OUT-BREAKS Confirmed.	CATTLE found Diseased.	CATTLE Slaughtered as having been exposed to Infection.	OUT-BREAKS Con-firmed.	SWINE Slaughtered as Diseased, or as having been exposed to Infection.
	No.	*No.*	*No.*	*No.*	*No.*
September, 1900	—	—	—	69	1,036
December, 1900	—	—	—	39	577
March, 1901	—	—	—	64	1,265
June, 1901	—	—	—	67	1,242
September, 1901	—	—	—	72	1,089
December, 1901	—	—	—	24	436
March, 1902	—	—	—	38	644

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax**, **Glanders**, and **Rabies** in Ireland in each of the under-mentioned periods.

QUARTER ENDED	Anthrax.		Glanders (including **Farcy**).		Rabies. Cases Reported.	
	OUT-BREAKS REPORTED.	ANIMALS ATTACKED.	OUT-BREAKS REPORTED.	ANIMALS ATTACKED.	DOGS.	OTHER ANIMALS.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
September, 1900	—	—	1	1	1	—
December, 1900	—	—	2	2	5	1
March, 1901	—	—	1	1	1	—
June, 1901	1	2	3	3	—	1
September, 1901	—	—	—	—	—	—
December, 1901	1	2	1	2	—	—
March, 1902	—	—	4	13	—	—

ORDNANCE SURVEY MAPS OF GREAT BRITAIN AND RELAND.

The Ordnance Survey are issuing a new series of folding pocket maps for England and Wales on the scale of one inch to the mile. The maps are printed in colours on sheets 18 by 12 inches, mounted on canvas, in a cover or flat, price 1s. each. The one-inch map can also be procured at the same price in black and white, showing outline and contours; or in outline, with hills printed either in black or brown: the outline map has recently been revised. These maps are not only useful for general topographical purposes, but should also prove serviceable to cyclists and pedestrians, since they show all roads, indicating their character and whether metalled or not, footpaths, hills, rivers, towns, villages, railway stations, and local boundaries.

Combined one-inch outline maps have also been published for a number of districts.

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The Agents for the sale of Ordnance Survey Maps are also, as a rule, agents for the sale of Geological Survey Publications.

THE "BOARD OF TRADE JOURNAL."

The "Board of Trade Journal," now published weekly at the cost of one penny, is the principal medium through which intelligence collected by the Commercial Intelligence Branch of the Board of Trade and intended for general information is conveyed to the public. It contains notices of contracts for tender and other openings for trade abroad; particulars of changes affecting British trade in foreign and colonial customs tariffs; special articles on the trade and industries of foreign countries and British possessions; items of interest under such sectional headings as "Proposed Tariff Change," "Shipping and Transport" (containing port charges and changes, new steamship-lines, trade and rates, &c.); "Minerals, Metals and Machinery," &c., and other information likely to be useful to manufacturers and traders. Various statistical tables and reviews of recent Government publications are also included in the contents.

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THE "LABOUR GAZETTE."

The "Labour Gazette," the Journal of the Labour Department of the Board of Trade, contains an article each month on the state of employment among agricultural labourers in the various parts of the United Kingdom. Special articles also appear therein from time to time on the rates of wages paid to agricultural labourers, the Hiring Fairs in Great Britain, and on migratory Irish agricultural labourers. The "Labour Gazette" is issued on the 15th of each month, and may be obtained direct from the Publishers, Messrs. Horace Marshall and Son, Temple House, Temple Avenue, London, E.C., at the rate of 2s. per annum, post free. Copies may also be ordered through any newsagent, price 1d. each.

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LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE.

(a.) *Leaflets dealing with Insects and Fungi.*

No.	Title.	No.	Title.
1	Mites on Currant and Nut Trees.	33	Surface Caterpillars.
2	Vine and Raspberry Weevils.	34	The Woolly Aphis or American Blight.
3	The Turnip Fly or Flea.	35	The Celery Fly.
4	Caterpillars on Fruit Trees.	38	The Carrot Fly.
5	The Mangel Wurzel Fly.	41	The Red Spider or Spinning Mite.
10	Wireworms.	46	The Stem Eelworm.
11	The Daddy Longlegs.	47	The Asparagus Beetle.
12	The Gooseberry Saw-Fly.	48	The Pea Thrips.
14	The Raspberry Moth.	49	The Fruit Tree Beetle.
15	The Apple Blossom Weevil.	52	Gooseberry Blight.
16	The Apple Sucker.	53	The Pear Midge.
19	Pea and Bean Weevil.	56	The Canker Fungus.
20	The Magpie Moth.	60	The Wood Leopard Moth.
21	The Warble Fly.	62	Pear and Cherry Saw-Fly.
22	The Diamond Back Moth.	64	White Root Rot.
23	Potato Disease.	65	The Small Ermine Moths.
24	The Ribbon Footed Corn-Fly.	68	Currant Aphides.
25	The Cockchafer.	69	Tent Caterpillars.
30	The Codlin Moth.	70	Winter Washing of Fruit Trees.
31	The Onion Fly.	71	The Colorado Beetle.

(b.) *Leaflets dealing with Birds useful to Agriculture.*

40	The Kestrel or Windhover.	45	The Starling.
42	The Short-Eared Owl.	50	Water Wagtails or "Dishwashers."
43	Titmice.	51	The White or Barn Owl.
44	The Common Lapwing, Plover, or Peewit.	54	The Spotted Flycatcher.
		55	The Swallow.

(c.) *Leaflets dealing with Diseases of Animals.*

28	Anthrax.	37	Rabies.
29	Swine Fever.	61	Sheep Scab.

(d.) *Leaflets relating to Acts of Parliament.*

8	Farmers and Assessments to Local Rates.	26	Farmers and the Income Tax.
17	Preservation of Commons. (*Out of print.*)	27	Remission of Tithe Rentcharge.
18	Fertilisers and Feeding Stuffs Act.	39	Assessment to Land Tax.
		59	Improvement of Land Act, 1899.
		66	Workmen's Compensation Act, 1900.

(e.) *Leaflets dealing with Miscellaneous Subjects.*

6	The Field Vole.	57	External Parasites of Poultry.
7	Autumn Catch Crops and Fodder Supply. (*Out of print.*)	58	Internal Parasites of Poultry.
9	Ensilage.	63	Destruction of Charlock.
13	Acorn Poisoning.	67	Favus in Poultry.
32	Foul Brood or Bee Pest.	72	Purchase of Artificial Manures.
36	Cultivation of Osiers.	73	Cultivation of Maize for Fodder.

Copies of these leaflets may be obtained free of charge and post free on application to the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

THE JOURNAL
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BOARD OF AGRICULTURE.

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FINGER-AND-TOE IN TURNIPS.

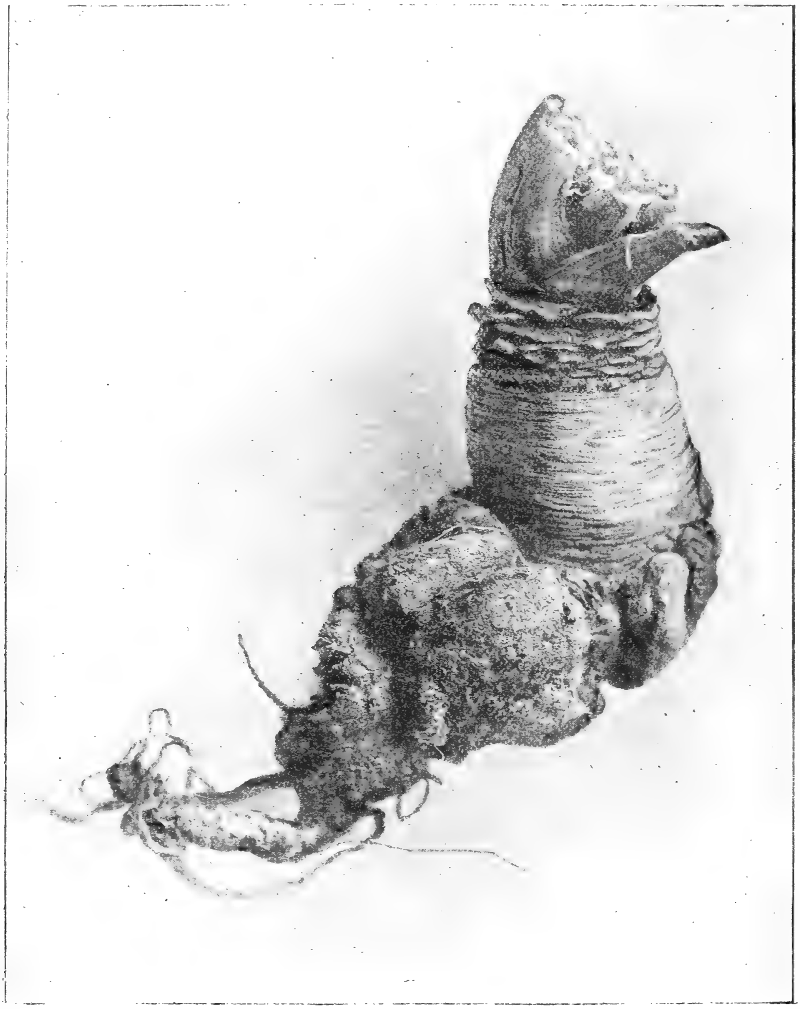
Plasmodiophora brassicae.

This disease—known also as Anbury, Club Root, and "Grub" —attacks most, if not all, crops belonging to the order *Cruciferae*, such as turnips, swedes, cabbages, kohl rabi, rape, radishes, &c., and often proves very destructive. It is not too much to say that in some parts of the country it is the greatest trouble with which the arable farmer has to contend, and annually occasions much loss and expense.

Although the name that this disease popularly bears in some parts of the country, "Grub," would lead one to believe that the cause of trouble is an insect, this is not the case, the source of the mischief being really a fungus so small as to be perceptible only by the aid of a strong microscope. This minute organism is capable of existing for some years in a quiescent condition in the soil, but when a crop that it can attack is sown upon the ground, it enters the fine roots, multiplies rapidly in the tissues, and induces malformation and decay.

Like many other fungoid diseases, this is extremely infectious, as may be readily proved by taking some portions of diseased root or soil from a diseased field and spreading such material on ground on which cruciferous plants are to be grown. In the great majority of cases, this treatment will be followed by an attack of the disease, which, however, in the first year, will be sharply confined to the area thus artificially infected. This shows that finger-and-toe does not spread from plant to plant through the air, as is the case with many other diseases, such,

for example, as potato disease. It does, however, readily spread from the first point of attack in various ways. For instance, it may be borne in soil which sticks to the plough, to the wheels of



Specimen of Turnip (slightly reduced in size) in advanced stage of attack by Finger-and-Toe.

carts or other agricultural implements, or to the feet of workers, horses, or sheep. Suppose that a small patch of turnips in a large field is affected by finger-and-toe, a certain amount of soil will be borne from this patch and dropped elsewhere on the field every time a plough, harrow, cultivator, or scuffler crosses it, and wherever such soil is dropped a new centre of infection is

established. Or the crop may be folded on the land with sheep, and the animals crossing and recrossing the diseased patch will soon bring about infection on a wider area. Under other circumstances the crop may be lifted and carted to the homestead, and some of the diseased turnips may get amongst the dung which in the succeeding season may be used to manure a turnip crop on another field, and so the disease may appear where it was never seen before. Or diseased roots may be spread on a grass field to be consumed by stock, and a year or two later this field may be under turnips, when serious infection may be revealed. The refuse of the root-house is a fruitful source of infection on a small scale, and such material should never be put either amongst the dung or on a tillage field.

Prevention and Cure.

Although this disease is widespread and destructive, much may be done to limit its ravages. It is practically unknown on soils naturally containing a high percentage of lime. The artificial application of burned lime has long been practised as a preventive, and this substance is still the most effective agent that is known. The usual custom is to apply 5 to 7 tons per acre, the dressing being given in the autumn, either six months or eighteen months before a turnip crop is to be grown. On the whole, the better of these two systems would appear to be that of applying the lime eighteen months ahead of the turnip crop. Under either the four or five course shift, this will mean spreading the lime on the ley before it is broken up for a corn crop.

Another system is to put on a small dressing, say 1 to 2 tons, directly after a turnip crop is removed. To spread such a small quantity evenly over the land, it is necessary first to slake it, and afterwards to fill it into carts, spreading by means of shovels directly from the carts. If a considerable amount of disease is present, the dose of lime may be increased somewhat, whereas if the field is sound, or nearly sound, the dressing need not exceed 1 to 1½ tons. In this case the treatment is to be regarded purely as a preventive measure.

Although the effects of lime applied directly a turnip crop is removed will not be observable, so far as the prevention of

finger-and-toe is concerned, for some years—that is to say, not till the next turnip crop comes to occupy the ground—still it may so improve the intervening crops as to be profitable. The use of ground lime in small quantities (5 to 10 cwt. per acre) has been extensively tested, but the results do not show that lime in this form is more effective than slaked lime, while it is more costly, and often less pure. Moreover, such a small dressing, unless applied annually, has but little effect on the disease, though it may have a considerable influence in other ways.

Other forms of lime are also more or less effective, though none is so powerful as common burned limestone, which is subsequently slaked before spreading. If gas-lime be used, it should be put on not later than eighteen months ahead. Used in this way, at the rate of 3 to 4 tons per acre, it has, first of all, the opportunity of increasing the yield of the corn crop, and in the following year it gets the chance to act on finger-and-toe. Chalk has also a preventive influence, though its effects are weaker than those of either forms of lime.

Although many farmers appear to think that this disease can only be prevented or cured by the use of lime, there is no doubt that its spread and virulence can be greatly affected in other ways. Attention has already been called to the extraordinary infectious character of the disease, and this fact should always be borne in mind by those who have to deal with infected land. It often happens that, to begin with, the disease appears only in certain small portions of a field, frequently the headlands, and while it is still on a circumscribed area, no trouble or expense should be spared to stamp it out. If this be neglected it will soon spread all over the field, and, with careless management, all over the farm. Working the land while out of condition is a common predisposing cause of an outbreak. Land that is soured by want of drainage, or a patch that is suffering in consequence of a burst drain, frequently exhibits the disease.

Neglecting to keep land clear of charlock and other cruciferous weeds must contribute to the spread of the disease, for it is in such plants that it lives when a field is not under turnips.

A method of suppressing the disease that is generally

successful is to arrange the rotation in such a way that a turnip or similar crop does not occupy the land oftener than once in eight years. In the four course shift, for instance, it may be possible to put half the fallow break under potatoes or mangolds; and if this is done intelligently turnips will not come on the same land oftener than once in eight years, and this should effectually banish finger-and-toe. A similar result will be got by leaving land in grass for three or four years. Needless to say, no such method of prevention will have much effect unless farmers also take care to avoid carting diseased turnips or tainted dung on to such fields.

Experiments have shown that acid manures encourage finger-and-toe, and this fact should be borne in mind in the cultivation of land that exhibits a tendency to this disease. The best phosphatic manure to use, under these circumstances, is basic slag or precipitated phosphate.

Of late years several so-called disease-proof turnips have been put on the market, and though all are certainly not immune from disease, some are markedly resistant.*

* Copies of this article may be obtained in leaflet form, free of charge and post free, on application to the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

THE COMPOUNDING OF RATIONS FOR FARM STOCK.

In the judicious blending of the home-grown and purchased foods of the farm lies the chief factor in economical feeding of live stock. Modern chemistry has taught us the composition of the numerous food-stuffs, physiology the functions of the various constituents of foods in the animal economy, and numerous and careful feeding trials, conducted mainly in Germany, America, and our own country, guide us as to proportions and quantities required by various classes of live stock. Here is a happy illustration of the application of the Royal Agricultural Society's motto—"Science with Practice."

The table on the next page contains a list of the food-stuffs used in forming the rations hereinafter described, with the digestible percentage of nutrients which they contain.

The important nutrients, as was fully explained in the article on "The Purchase of Feeding Stuffs" in the June number of this Journal, are the *albuminoids* (proteids) and *amides*, consisting of the elements carbon, hydrogen, oxygen and nitrogen (the albuminoids also contain a little phosphorus and a trace of sulphur), and the *fats* and *carbohydrates*, which consist of carbon, hydrogen and oxygen, but no nitrogen. Only the albuminoids are capable of forming animal tissue—hair or wool, skin, muscle, nerve, &c.—and hence are often spoken of as the *flesh formers.* The carbohydrates—comprising sugar, and such substances as are convertible into sugar in the process of digestion, as starch and digestible woody fibre—and fats are mainly responsible for keeping up the heat (the motive power) of the animal machine, and when taken in excess of what is required for this purpose are stored in the body as fat; from a feeder's point of view, therefore, they would be regarded as the *fat formers.*

AVERAGE PERCENTAGE of DIGESTIBLE CONSTITUENTS in ordinary FOOD-STUFFS.—(From *Wolff's Table* mainly.)

Feeding Stuffs.	Albuminoids and Amides.	Fats.	Carbo-hydrates.
Decorticated Cotton Cake... ...	36·9	10·0	18·7
Rough Cotton Cake...	18·c	5·9	17·7
Linseed Cake	24·7	9·6	29·8
Linseed	20·1	35·2	18·9
Beans...	22·0	1·4	50·0
Peas	20·1	1·4	53·0
Dried Grains...	14·9	6·4	33·9
Wet (fresh) Grains	3·9	1·3	9·9
Bran (wheat) coarse...	10·6	2·4	44·4
Wheat	11·7	1·2	64·3
Wheat Middlings	8·9	2·6	54·8
Flour	8·6	1·0	69·8
Oats	8·0	4·3	44·7
Oatmeal	11·3	5·8	50·2
Barley	7·7	2·3	57·6
Maize...	8·0	4·0	68·6
Hay (average meadow)	5·4	1·0	40·7
*Oat Straw	1·4	·7	40·1
*Barley Straw...	1 4	·6	40·4
Bean Straw	5·0	·5	35·1
Pea Straw	3·2	·5	33·4
Locust Bean Meal	2·7	1·1	74·2
Potatoes	2·1	·2	21·8
Swedes	1·3	·1	10·6
Turnips	1·1	·1	6·1
Mangolds	1·1	·1	10·0
Treacle (Molasses)	11·8	—	59·9
New Milk	3·2	3·6	5·0
Buttermilk	4·0	1·1	4·1
Separated Milk	3·9	·4	4·5
Whey...	·8	·1	4·9

* Barley being generally more dead ripe when cut than oats, its straw is not as good compared with oat straw as appears above.

The amides, although nitrogenous, are not flesh formers, and are only considered to be of about half the value of carbohydrates as heat producers. They are simple nitrogenous compounds occurring in the plant during its growing period, but destined to be more fully organised into albuminoids as the plant matures. About one-fourth of the nitrogenous matter in young grass, and one-half in roots—carrots, turnips, mangolds—consists of asparagine and other amides, while cakes, corn, hay and straw contain but a trace of amide matter. In the animal, the opposite process takes place, albuminoid substances, such as worn-out muscle, degenerating into the soluble amide, urea, in order that they may be easily eliminated from the system. To avoid complications, all nitrogenous matter has been taken as

albuminoids or flesh formers in constructing the rations which follow, for the amides are not given separately in ordinary Food Tables, and they affect results so slightly that sufficient allowance for all practical purposes can be made for them by taking the proportion of nitrogenous matter in a diet a trifle higher than otherwise might be done. The amides in 56 lb. of turnips would not form more than one-tenth of the total nitrogenous matter in a winter ration of a milking cow.

Moreover, there are some striking facts in cattle and sheep feeding which lead one to hesitate in dissociating too readily the albuminoids and amides. For instance, thousands of young growing sheep are well fattened on turnips alone every winter, making flesh and wool as well as fat in the process. Now supposing each such hogget (teg) to eat 2 stones of swedes a day, it would obtain rather above one-third of a pound of nitrogenous matter, which if entirely albuminoid would be about sufficient for the sheep's requirements so far as flesh-forming food is concerned. But half of it is not albuminoid, but amide, which is not regarded as flesh-forming food. Again, in bygone days, many a good carcase of Scotch beef has been fed exclusively during the fattening period on oat straw and swedes, perhaps at the rate of 6 stones of swedes and 2 stones of straw a day. This diet would contain something over $1\frac{1}{2}$ lb. of digestible nitrogenous matter, sufficient for the slow feeding of an adult beast if it were all truly albuminoid, but as half the nitrogenous matter of the swedes consists of amides, the animal is left with no more than 1 lb. of digestible albuminoids for tissue forming—an altogether inadequate amount according to the teachings of all the feeding trials of recent years. Now it has been proved that, be the eaten quantity of albuminoids ever so small, some of it gets broken up in the animal system to form fat instead of fleshy tissue, and may it not be that the amides, by being similarly broken up for this purpose, prevent this diversion of albuminoids from their special flesh-forming function, and thus effect a saving of albuminoid waste? If so, then up to a certain point amides would be rightly reckoned with albuminoids in making ration calculations.

As one pound of fat goes as far in heat production or

fat formation as 2·4 pounds of sugar (digested carbohydrates), the fats are multiplied by 2·4 to bring them to carbohydrate value; and the ratio of the albuminoid matter in any food to this carbohydrate value is called the *albuminoid ratio* of that food. For example, the albuminoid ratio of oats is said to be 1 to 6·9, that is 1 part by weight of albuminoid matter to 6·9 parts of fat and carbohydrates both expressed in carbohydrate value or sugar equivalent, or, as the farmer might say, one part of flesh-forming food to nearly 7 of fattening food. Referring to the above Table for the composition of oats, we find that they contain 8 per cent. of digestible albuminoids, 4·3 of fat, and 44·7 of carbohydrates, and to find the albuminoid ratio from these figures, we multiply 4·3 by 2·4 to bring the fat to carbohydrate value, and add the result (10·32) to the 44·7 of carbohydrate, getting a total of 55·02; then dividing this by the 8 of albuminoids we get as quotient 6·9, or an albuminoid ratio of 1 to 6·9; or expressed in arithmetical form $(4{\cdot}3 \times 2{\cdot}4 + 44{\cdot}7) \div 8 = 6{\cdot}9$. A ratio is spoken of as narrower or wider according as the difference between the two numbers is less or more; thus, 1 to 4 is a narrower ratio than 1 to 8.

In devising rations for farm stock the following principles have to be observed:—

1. The albuminoid ratio required by a sucking animal is about 1 to $3\frac{1}{2}$, as in new milk; by half-grown cattle and sheep, growing and fattening at the same time, 1 to 4 or 5; by a cow in full milk, or a growing and fattening pig, 1 to 5 or 6; and by an adult animal simply fattening, or by a working horse, 1 to 8.

2. Ruminant animals, as cattle and sheep, must have bulky matter in their diets, such as grass, hay, straw and roots, and are well capable of dealing with crude fibre like that contained in straw and hay. Pigs, on the other hand, require a more concentrated food, and are not adapted for feeding on crude fibre; and even horses, while digesting corn quite as well as or even better than sheep and cattle, can only digest straw to half and grass and hay to four-fifths the extent that ruminants can.

3. Cows require a diet that shall be somewhat relaxing to the bowels, so that when grass is not available roots, old-land hay, bran, or small quantities of linseed or treacle have to be relied on for keeping them right in this matter.

4. The bare maintenance diet of a full-grown average-sized ox or dry cow is about 14 lb. of digestible dry matter a day, on which it neither gains nor loses weight. The same is sufficient for an average-sized adult sheep for a week. In fattening, or when yielding a full supply of milk, cows and sheep will generally eat half as much again, that is, 21 lb. of digestible matter, but rarely more. The maintenance diet of an ordinary cart-horse when not at work is from 10 to 12 lb. of digestible dry matter, and when in full work about 21 lb.

DAILY RATIONS FOR COWS IN FULL MILK.

Good pasture grass in May has an albuminoid ratio as narrow as 1 to 4, which two months later is widened to 1 to 7; hence we see how excellently adapted it is for spring-born lambs, calves and foals, and for milking cows, ewes and mares during the early part of the summer, and why it should be improved for them later on by an addition of more albuminoid matter. Up to the end of June, then, good pastures supply food sufficiently high in albuminoids to enable the cow to milk at her best, but by the end of July the albuminoids being only 1 to 7 of carbohydrates instead of 1 to 5 or 6 (about what is required by a cow in full milk), and later on still less, the albuminoids should be brought up to the right standard by the addition of decorticated cotton cake for all summer and autumn calving cows soon after they have calved, thus :—

lb.		Albds.	Fat.		Carbohydrates.
104 Grass (in August) ...	=	2·08 lb.	·52 lb.		14·68 lb.
2½ Decorticated Cotton Cake	=	·92	·25		·47
			·77 × 2·4	=	1·85
		3·00			17·00

Ratio 1 to 5.6 (nearly).

For cows that have calved in winter and early spring, and by this time are naturally going off their milking, this addition of cake is unnecessary, though it would benefit the land; neither is it necessary when cows are put on aftermath full of clover. Commencing with 1 lb. a day in July, the cake would gradually be increased on ordinary pasture to 2½ lb. by the end of August. Some pastures produce very soft butter in June, and an addition of 1 lb. of decorticated cotton cake, though not

otherwise required, would have the effect of stiffening the butter considerably.

In this and the following winter-rations it is assumed that the cow—an average shorthorn of from 11 to 12 cwt.—will require 3 lb. of digestible alluminoids and 17 of digestible carbohydrate-equivalent a day, which gives a ratio of 1 to 5·6 (nearly). As cows under similar conditions practically eat in proportion to their weights, these rations may be modified to suit smaller cows by simply reducing the quantity of each food-stuff in a ration proportionately, and the ratio will, of course, remain the same. Thus, taking an ordinary Ayrshire cow's weight at 900 lb. as against 1,200 of the shorthorn, she will require as a diet three-fourths of the following shorthorn rations; and assuming a Jersey cow to weigh 800 lb. she will require two-thirds of these rations as a daily allowance.

In arranging a cow's ration from home-grown and purchased foods, the farmer will be largely guided by the quantities at his disposal and market prices. He should then, by way of a start, write down approximately the weights of roots, long fodder, and meal that a cow will require, omitting for the moment the highly albuminoid food, and remembering that the roots will be somewhere between 2 and 4 stones, the fodder about 1½ stones, and the "trough" food from 6 to 10 lb., part of which will be home-grown corn meal and part a highly albuminoid purchased food. He should next calculate out the constituents—albuminoids, fat, and carbohydrates—by the Food Table, and see how much short the albuminoids are of 3 lb., and supply the deficiency by means of the cake or other purchased food. When all is totalled up, he will probably find that a little adjustment of weights is necessary to get exactly the 3 lb. albuminoids and the 17 carbohydrates required. Bearing in mind the following points the adjusting will not be difficult, viz., that straw will affect the carbohydrates without materially affecting the albuminoids, that the first seven foods named in the Table mainly influence the albuminoids, and that roots, hay, and corn meals affect both the albuminoids and carbohydrates nearly proportionately. Take a case by way of illustration:—A farmer thinks he can afford his cows 3 stones of swedes a day, to be given in two meals; as far as his fodder

is concerned he knows he is somewhat short of hay as compared with straw, he therefore decides to give one foddering a day of hay and two fodderings of oat straw of about 7 lb. each; and about half the trough food he intends to consist of crushed oats, say 4 lb., the remainder of decorticated cotton cake; he then writes down :—

42 lb. swedes
7 ,, hay
14 ,, oat straw
4 ,, crushed oats

and calculates their constituents out by the Table.

Thus, calling the figures pounds, remove the decimal point two places to the left to get the weight in 1 lb. of the food instead of in 100 lb., and multiply by the number of pounds of food taken to get the weight of each constituent in the weight of food taken—in practice it is better to move the point *after* multiplying instead of before as has been done here. Then in 42 lb. swedes he gets :—

1·3 × 42 = ·546 albuminoids
·1 × 42 = ·042 fat
10·6 × 42 = 4·452 carbohydrates.

For the sake of simplicity disregard the third figure to the right of the point if it be less than five, and if it be five or more add one to the second figure after the point.

In the same way the 7 lb. of hay give :—

5·4 × 7 = ·378 or ·38 albuminoids
1·0 × 7 = ·07 fat
40·7 × 7 = 2·849 or 2·85 carbohydrates

the 14 lb. of straw :—

1·4 × 14 = ·196 or ·20 albuminoids
·7 × 14 = ·098 or ·10 fat
40·1 × 14 = 5·614 or 5·61 carbohydrates

and the 4 lb. crushed oats :—

8·0 × 4 = ·32 albuminoids
4·3 × 4 = ·172 or ·17 fat
44·7 × 4 = 1·788 or 1·79 carbohydrates.

The albuminoids now total up to 1·45 lb. which, subtracted from 3, leave 1·55 lb. to be supplied by means of the decorticated cotton cake. Now 1 lb. of cake contains ·37 of albuminoids,

therefore $4\frac{1}{4}$ lb. will fully supply the deficiency, and we get the following ration :—

lb.			Albds.	Fat	Carbo-hydrates.
42	Swedes	=	·55	·04	4·45
7	Hay	=	·38	·07	2·85
14	Oat Straw	=	·20	·10	5·61
4	Oats	=	·32	·17	1·79
$4\frac{1}{4}$	Decorticated Cotton Cake	=	1·57	·43	·79
				·81 × 2·4 =	1·94
			3·02		17·43

Not much adjustment is here required, as the albuminoids are about right, and the carbohydrates not greatly in excess of requirements. The withdrawal of 1 lb. oat straw would make the ration throughout as nearly right as possible; we then get—

lb.			Albds.	Fat.	Carbo-hydrates.
42	Swedes	=	·55	·04	4·45
7	Hay	=	·38	·07	2·85
13	Oat Straw	=	·18	·09	5·21
4	Crushed Oats	=	·32	·17	1·79
$4\frac{1}{4}$	Decorticated Cotton Cake	=	1·57	·43	·79
				·80 × 2·4 =	1·92
			3·00		17·01

Of course, the great advantage of working out a ration in this way is to ascertain *exactly* the amount of *trough food* required. This will always include the chief albuminoid food, which is at the same time the most expensive, and the one to be purchased unless peas or beans are grown on the farm. These should be accurately weighed at the commencement, afterwards they may be measured by means of a marked bucket. In actual practice the roots and hay after once weighing would be guessed at, and the straw would probably be given less carefully than the hay, especially at the night foddering, to satisfy the appetite of beasts more hearty than the others; any straw remaining in the morning would be drawn back as litter.

WINTER RATIONS FOR COWS.

(*a*) *Farm largely arable—Milk sold.*

lb.			Albds.	Fat.	Carbo-hydrates
1.—54	Swedes	=	·70	·05	5·72
21	Oat Straw	=	·29	·15	8·42
$5\frac{1}{2}$	Decorticated Cotton Cake	=	2·03	·55	1·03
				·75 × 2·4 =	1·80
			3·02		16·97

lb.		Albds.	Fat.	Carbo-hydrates.
2.—56	Swedes ... ... =	·73	·06	5·94
16	Oat Straw ... ... =	·22	·11	6·42
4	Crushed Oats ... ... =	·32	·17	1·79
4¾	Decorticated Cotton Cake =	1·75	·48	·89
			·82 × 2·4 =	1·97
		3·02		17·01

Butter Made.

lb.		Albds.	Fat.	Carbo-hydrates.
3.—44	Swedes ... ... =	·57	·04	4·66
19	Oat Straw... ... ... =	·27	·13	7·62
4	Crushed Oats ... ... =	·32	·17	1·79
5	Decorticated Cotton Cake =	1·85	·50	·94
			·84 × 2·4 =	2·02
		3·01		17·03

lb.		Albds.	Fat.	Carbo-hydrates.
4.—28	Mangolds ... ... =	·31	·03	2·80
22	Oat Straw ... ... =	·31	·16	8·82
4½	Crushed Oats ... ... =	·36	·19	2·01
5½	Decorticated Cotton Cake =	2·03	·55	1·03
			·93 × 2·4 =	2·23
		3·01		16·89

On a farm that is largely arable roots and straw would be abundant and hay comparatively scarce. Rations 1 and 2 would contain too much swedes to make good butter. No. 2 is specially adapted for a light-land arable farm where turnips would be largely grown, but the straw would be short in growth. No. 4 might be used in the month of April when the swedes are expended and the mangolds ripe. It would be suitable also for a clay farm growing plenty of straw and more mangolds than swedes.

(*b*) *Farm half arable.*

lb.		Albds.	Fat.	Carbo-hydrates.
5.—35	Swedes ... ... =	·46	·04	3·71
6	Hay ... ... =	·32	·06	2·44
14	Oat Straw ... ... =	·20	·10	5·61
3½	Maize Meal .. ... =	·28	·14	2·40
4¾	Decorticated Cotton Cake =	1·75	·48	·89
			·82 × 2·4 =	1·97
		3·01		17·02

lb.			Albds.	Fat.	Carbo-hydrates.
6.—34	Swedes	=	·44	·03	3·60
7	Hay	=	·38	·07	2·85
15	Oat Straw	=	·21	·11	6·02
4	Crushed Oats	=	·32	·17	1·79
4½	Decorticated Cotton Cake	=	1·66	·45	·84
				·83 × 2·4 =	1·99
			3·01		17·09

lb.			Albds.	Fat.	Carbo-hydrates.
7.—30	Swedes	=	·39	·03	3·18
7	Hay	=	·38	·07	2·85
15	Oat Straw	=	·21	·11	6·02
4½	Crushed Oats	=	·36	·19	2·01
4½	Decorticated Cotton Cake	=	1·66	·45	·84
				·85 × 2·4 =	2·04
			3·00		16·94

lb.			Albds.	Fat.	Carbo-hydrates.
8.—24	Mangolds	=	·26	·02	2·40
7	Hay	=	·38	·07	2·85
15	Oat Straw	=	·21	·11	6·02
4	Maize Meal	=	·32	·16	2·74
5	Decorticated Cotton Cake	=	1·85	·50	·94
				·86 × 2·4 =	2·06
			3·02		17·01

lb.			Albds.	Fat.	Carbo-hydrates.
9.—41	Swedes	=	·53	·04	4·35
8	Hay	=	·43	·08	3·26
13	Oat Straw	=	·18	·09	5·21
5	Dried Grains	=	·75	·32	1·69
3	Decorticated Cotton Cake	=	1·11	·30	·56
				·83 × 2·4 =	1·99
			3·00		17·06

lb.			Albds.	Fat.	Carbo-hydrates.
10.—28	Mangolds	=	·31	·03	2·80
6	Hay	=	·32	·06	2·44
11	Oat Straw	=	·15	·08	4·41
4	Wheat Meal	=	·47	·05	2.57
8	Bean Meal	=	1·76	·11	4·00
				·33 × 2·4 =	·79
			3·01		17·01

On a half arable farm, one foddering of hay a day could probably be spared the cows, and the more complex the mixture the better it seems to nourish the beast, and the more appetising it is. Of all the cow rations here given Nos. 5 and 6 have

invariably proved with the writer the best for yielding milk, although the ratio of these diets is the same as the others ; and this at once suggests that foods have a subtle influence on each other in the matter of digestibility. It has been discovered that starchy matter added to straw reduces its digestibility, while oily food, if it does not promote, certainly does not check it. No. 10 consists of foods which are largely grown on clays or clay-loams, and is therefore well adapted for use on strong-land farms, and it has the merit of not necessitating the purchase of any imported food. On the other hand, it holds little fat, but contains much starch, and, therefore, in accordance with the statement just made, its straw will not be so easily digested as in diets containing cotton or other oil cake. No. 7 would suit a farm having but few swedes for consumption, and No. 8 for spring feeding. If the market price of oats were good and maize or dried grains were cheap, it might be more profitable to sell oats and buy maize or dried grains, and adopt No. 5 or 9 instead of 6.

(c) Farm about one-third arable.

	lb.		Albds.	Fat.	Carbo-hydrates.
11.—	30	Swedes	= ·39	·03	3·18
	14	Hay	= ·76	·14	5·70
	8	Oat Straw	= ·11	·06	3·21
	3½	Maize	= ·28	·14	2·40
	4	Decorticated Cotton Cake	= 1·48	·40	·75
				·77 × 2·4 =	1·85
			3·02		17·09

	lb.		Albds.	Fat.	Carbo-hydrates.
12.—	25	Mangolds...	= ·27	·03	2·50
	14	Hay	= ·76	·14	5·70
	9	Oat Straw...	= ·13	·06	3·61
	5	Middlings...	= ·45	·13	2·74
	3¾	Decorticated Cotton Cake	= 1·38	·38	·70
				·74 × 2·4 =	1·78
			2·99		17·03

	lb.		Albds.	Fat.	Carbo-hydrates.
13.—	30	Swedes	= ·39	·03	3·18
	14	Hay	= ·76	·14	5·70
	7	Oat Straw	= ·10	·05	2·81
	5	Crushed Oats	= ·40	·21	2·23
	7½	*Rough* Cotton Cake ...	= 1·35	·44	1·33
				·87 × 2·4 =	2·09
			3·00		17·34

On this sort of farm hay would be more abundant than in the case of (*a*) and (*b*), while roots and straw would be less so. Consequently, Rations 11, 12, and 13 provide for twood fderings of hay and only one of straw, with a smaller quantity of roots.

(*d*) *Grass Farms.*

lb.			Albds.	Fat.	Carbo-hydrates.
14.—23	Mangolds	=	·25	·02	2·30
31	Hay	=	1·67	·31	12·62
3	Decorticated Cotton Cake	=	1·11	·30	·56
				·63 × 2·4 =	1·51
			3·03		16·99

lb.			Albds.	Fat.	Carbo-hydrates.
15.—30½	Hay	=	1·65	·31	12·41
6	Bran	=	·64	·14	2·66
2	Decorticated Cotton Cake	=	·74	·20	·37
				·65 × 2·4 =	1·56
			3·03		17·00

lb.			Albds.	Fat.	Carbo-hydrates.
16.—28	Hay	=	1·51	·28	11·40
10	Dried Grains	=	1·49	·64	3·39
¼	Treacle	=	·03	—	·15
				·92 × 2·4 =	2·21
			3·03		17·15

Dissolve the treacle in 2 gallons of hot water, mix with the grains, and serve the next day.

lb.			Albds.	Fat.	Carbo-hydrates.
17.—30	Hay	=	1·62	·30	12·21
2	Maize Meal	=	·16	·08	1·37
2	Pea Meal	=	·40	·03	1·06
2	Decorticated Cotton Cake	=	·74	·20	·37
½	Linseed	=	·10	·18	·09
				·79 × 2·4 =	1·90
			3·02		17.00

Pour 1 gallon of *boiling* water on the linseed at night. Stir in the meals and cake next day just before serving, adding a little salt.

In reference to Ration 14, which is intended for a clay farm growing strong meadow grass, it is suggested that a patch of a few acres be ploughed and always kept for mangolds. This root can be grown on the same land year after year quite successfully; one advantage of such a system being that the land is always

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clean and ready for the crop to be drilled early in the spring. In these rations the laxative element is supplied respectively by the mangolds, bran, treacle, and linseed. Whether the treacle or linseed is absolutely necessary will depend on the nature of the hay. If "herby," that is, containing rib-wort, yarrow, the smaller umbelliferæ, &c., it may be sufficiently laxative of itself.

The complex compounding of No. 17, with the oil supplied in the cake and linseed, makes it a particularly relishing and digestible diet.

(e) A Town Dairy.

lb.		Albds.	Fat.	Carbo-hydrates.
18.—24 Hay	=	1·30	·24	9·77
2 Maize Meal	=	·16	·08	1·37
40 Fresh Grains (wet) ...	=	1·56	·52	3·96
			·84 × 2·4 =	2·02
		3·02		17·12

Also rations 15, 16, and 17.

In town cowsheds roots, as a rule, are not used in large quantity, if at all, on account of the expense. To keep the cows' relish for their food keen, so that they may be fit for the butcher as soon as they become dry, it is the custom, therefore, to chaff some portion of the hay, scald or steam it, and mix it with the meal or bran, and thus allow the cows two moist meals between the dry ones. Where roots are consumed this is not necessary, for healthy milking cows have good appetites and seem to thoroughly enjoy the chewing of long fodder when alternated with juicy roots.

FATTENING RATIONS FOR ADULT CATTLE.

The term adult may here be taken to apply to cows and 3-year-old bullocks. For such cattle an albuminoid ratio of 1 to 8 has been found very suitable, so that $2\frac{1}{4}$ lb. of digestible albuminoids and 18 lb. of digestible carbohydrates would form a good ration. The following are arranged on this basis :—

lb.		Albds.	Fat.	Carbo-hydrates.
1. 101 Swedes	=	1·31	·10	10·71
15 Oat Straw	=	·21	·11	6·01
2 Decorticated Cotton Cake	=	·74	·20	·37
			·41 × 2·4 =	·98
		2·26		18·07

lb.	Albds.	Fat.	Carbo-hydrates.
2.—100 Swedes ... ... =	1·30	·10	10·60
14 Oat Straw ... ... =	·20	·10	5·61
4¼ *Rough* Cotton Cake ... =	·76	·25	·75
		·45 × 2·4 =	1·08
	2·26		18·04

lb.	Albds.	Fat.	Carbo-hydrates.
3.—60 Swedes ... ... =	·78	·06	6·36
19 Oat Straw... ... ... =	·27	·13	7·62
4¾ Crushed Oats ... ... =	·38	·20	2·12
2¼ Decorticated Cotton Cake =	·83	·23	·42
		·62 × 2·4 =	1·49
	2·26		18·01

lb.	Albds.	Fat.	Carbo-hydrates.
4.—42 Swedes ... ... =	·55	·04	4·45
7 Hay ... ... =	·38	·07	2·85
15 Oat Straw... ... ... =	·21	·11	6·01
4 Maize Meal ... ... =	·32	·16	2·74
2½ Decorticated Cotton Cake =	·92	·25	·46
		·63 × 2·4 =	1·51
	2·28		18·02

lb.	Albds.	Fat.	Carbo-hydrates.
5.—28 Swedes ... ... =	·36	·03	2·97
14 Hay ... ... =	·76	·14	5·70
14 Oat Straw... ... ... =	·20	·10	5·61
2½ Crushed Oats ... ... =	·20	·11	1·12
3 Linseed Cake ... ... =	·74	·29	·89
		·67 × 2·4 =	1·61
	2·26		17·90

lb.	Albds.	Fat.	Carbo-hydrates.
6—29 Swedes ... ... =	·38	·03	3·07
14 Hay ... ... =	·76	·14	5·70
13 Oat Straw... ... ... =	·18	·09	5·21
4 Crushed Oats ... ... =	·32	·17	1·79
3½ *Rough* Cotton Cake ... =	·63	·21	·62
		·64 × 2·4 =	1·54
	2·27		17·93

lb.	Albds.	Fat.	Carbo-hydrates.
7—30 Mangolds ... ... =	·33	·03	3·00
8 Hay ... ... =	·43	·08	3·26
16 Oat Straw... ... ... =	·22	·11	6·42
4½ Wheat Meal ... ... =	·49	·05	2·89
3½ Bean Meal ... ... =	·77	·05	1·75
		·32 × 2·4	·77
	2·24		18·09

lb.		Albds.	Fat.	Carbo-hydrates.
8.—28	Hay ... ... =	1·51	·28	11·40
7	Maize Meal ... ... =	·56	·28	4·80
½	Linseed Cake ... ... =	·12	·05	·15
¼	Linseed ... ... =	·05	·09	·05
			·70 × 2·4 =	1·68
		2·24		18·08

Numbers 1, 2, and 3 are adapted for a farm mainly under the plough, No. 4 is for one half tillage and half grass, Nos. 5 and 6 are for one having about one-third of its land arable, No. 7 is for a farm of strong land where only home-grown foods are used, and No. 8 for a grass farm. Decorticated cotton cake containing a much higher percentage of albuminoid matter than any other oil cake, less of it is required to level up a food like straw, which is very deficient in albuminoids, to the standard ratio. Being also at the present time somewhat cheaper than linseed cake, rations containing it as the chief nitrogenous food-stuff can be more cheaply compounded than those containing linseed cake. Preference is also here given to cotton cake for butter-making rations, as it produces a firmer, less greasy, and more palatable butter than linseed cake. But for cattle up to a year old and sheep up to 6 or 7 months, linseed cake is much the safer one to use.

In barley-growing districts, barley straw would probably take the place of oat straw in these rations; not being so digestible, as a rule, a little allowance can be made by exercising a trifling generosity with the meal used. In the rapid feeding of cattle for the fat market it is more necessary to resort to chaffing, scalding, and mixing of foods, than in feeding cows for milk; the craving for food is keener in the latter than in the former, and fattening cattle are found to eat straw that has been chaffed, mixed with pulped roots and allowed to lie a day before being eaten, or chaff scalded and mixed with meal of some kind, and a sprinkle of treacle, better than in the long dry state. Also, where no roots are available, some hay-chaff scalded or steamed and mixed with the meal or other trough food, and given alternately with long hay, induces the cattle to eat with more relish. Cattle spices or condiments are often used for the same purpose.

RATIONS FOR YOUNG CATTLE.

Calves should be kept on new milk for the first two weeks of their lives, thereafter they may be put on to mixed new and separated milk. After the fourth week they begin to nibble at hay, and can be well kept on 2 gallons of separated milk a day to which is added 3 tablespoonfuls (2 oz.) of cod liver oil. At 10 weeks the oil may be discontinued, and the calf will then have to depend mainly on the carbohydrates of the hay for the heat and fat producing matter of its food. A little linseed cake, meal, and pulped swedes in winter, or grass in summer, should gradually be introduced, so that at 6 months old milk may be altogether discontinued if necessary. The calf will now thrive well up to a year old on from 1 to 1½ lb. of mixed linseed cake and meal, 4 lb. or more of hay, and 3 to 10 lb. of swedes (or grass in summer) a day, which will give an albuminoid ratio of 1 to 4½ or 1 to 5 according to the proportion of hay and roots eaten. On milk-selling and cheese-making farms, however, separated milk is not available, and recourse has to be had to milk substitutes or calf-meals to rear the heifer calves intended for breeding. There is no difficulty in compiling from our food table a meal that shall closely resemble milk in its digestible constituents, but it cannot be done without at the same time introducing a much larger amount of indigestible matter than occurs in milk ; this, and the question of choosing meals that will agree with the calf's stomach, constitute the practical difficulty of rearing calves without milk.

The following meals have been proved by the writer to be good milk substitutes, having an albuminoid ratio about the same as that of new milk :—

Calf Meals.

1.—Linseed Cake Meal,	14 parts	by weight
Crushed Linseed	5 ,,	,,
Wheat Flour	2 ,,	,,
Locust Bean Meal	2 ,,	,,

Mix 3 lb. with 5 qts. of boiling water and a sprinkle of salt, say ¼ oz., for the day's allowance of one calf—given at three meals under three months old, and at two meals above that age.

2.—Linseed Cake meal,	2 parts
Oatmeal	2 ,,
Crushed Linseed	1 ,,

Mix 3 lb. with 5 qts. boiling water over night, and stir and boil for 10 minutes next morning, serve at three or two meals with salt and sugar.

3. Where a small quantity of separated or skim milk is available :—

8 parts of Oatmeal
1 part of Crushed Linseed.

Scald $2\frac{1}{4}$ lb. over night with 5 pints of boiling water, boil for 10 minutes next morning, and add 5 pints of separated milk with a sprinkle of salt and a little sugar, for one calf per day.

Weaners on grass require no more than from $\frac{1}{2}$ to $\frac{3}{4}$ lb. mixed linseed cake and meal each per day in addition to grass to keep them in good thriving condition.

Yearling bullocks that are intended to be house-fed for early beef of, say, about 8 cwt. live weight at about 19 months old, should have the diet recommended for calves rising a year old, steadily increased until they finish with two-thirds of the ration of a full-milking shorthorn cow. The same feeding is suitable for fattening Irish heifers.

At about 15 months old the fattening yearling would in this way be receiving a diet like the following :—

21 lb. Swedes
7 ,, Hay
2 ,, Oats
3 ,, Linseed Cake

having a ratio of 1 to 5 ; and at about 18 months old, when finishing for the butcher, something like :—

37 lb. Swedes
10 ,, Oat Straw
3 ,, Oats
3 ,, Linseed Cake
2 ,, Decorticated Cotton Cake

having the same ratio.

Yearling store bullocks and heifers turned out to grass in the spring require no extra food, but should come in full of flesh in late autumn. For wintering yearling stores a liberal allowance of turnips and straw, with from 2 to 4 lb. per day each, according to size, of mixed decorticated cotton cake and meal, should be given in order to produce well-grown and "fresh" beasts for the spring store sales. If, however, they are intended for the fat market in the new year, when close upon two years old, they will require more liberal feeding, and by the beginning

of December will pay for a ration of five-sixths that of a cow in full milk, such as :—

1.	2.	3.
42 lb. Swedes.	42 lb. Swedes.	22 lb. Mangolds
14 ,, Oat Straw.	7 ,, Hay.	18 ,, Oat Straw.
3 ,, Crushed Oats.	6 ,, Straw.	4 ,, Crushed Oats.
4 ,, Decorticated Cotton Cake.	4 ,, Crushed Oats.	4½ ,, Decorticated Cotton Cake.
	5½ ,, Linseed Cake.	

As it is mainly on arable farms that winter feeding is followed, roots, straw and corn will for the most part form the home-grown contribution to the rations.

RATIONS FOR SHEEP.

In Scotland and over a large portion of England ewes wintering on grass require no more than a rack of hay, and generally get mangold and turnip-tops thrown out to them, and are run over the root land after the roots have been pulled and carted off to clean up small ones and stray leaves. As soon as they lamb they require a ration with an albuminoid ratio of 1 to 6 to keep up their milk supply and flesh. This is generally provided in the first three months of the year by means of swedes or mangolds, bean or pea straw, or mixed hay and straw chaff (oat or barley) and peas, linseed cake, oats and bran, &c.

The following rations supply the requirements of seven ewes for one day, or one ewe for a week; the quantity and quality of the digestible matter is almost the same as that of the cow rations, but as the ewe will get nearly all her water from the roots supplied, something like three times as many are given her for a week as to a cow for a day :—

lb.		Albds.	Fat.	Carbo-hydrates.
1.—120 Swedes	=	1·56	·12	12·72
5 Hay and Straw Chaff	=	·17	·04	2·02
5 Linseed Cake ...	=	1·24	·48	1·49
			·64 × 2·4 =	1·54
		2·97		17·77

lb.		Albds.	Fat.	Carbo-hydrates.
2.—120 Swedes	=	1·56	·12	12·72
2 Pea Straw	=	·06	·01	·67
2 Hay	=	·11	·02	·81
6 Peas	=	1·21	·08	3·18
			·23 × 2·4 =	·55
		2·94		17·93

lb.		Albds.	Fat.	Carbo-hydrates.
3.—80 Mangolds	=	·88	·08	8·00
6 Hay	=	·32	·06	2·44
6 Oats	=	·48	·25	2·68
5 Bran	=	·53	·12	2·22
2 Decorticated Cotton Cake	=	·74	·20	·37
			·71 × 2·4 =	1·0
		2·95		17·41

When the ewes and lambs are put on a good spring pasture they no longer require trough feeding; but should they be inclined to scour it would be well to continue oats for a while. As the ewe's milk diminishes the lambs should be kept progressing after July with about a pound of linseed cake or cracked peas to every seven lambs per day. When ewes or lambs are placed on clover aftermath they fatten without auxiliary food.

Hoggets (tegs) are extensively fattened during the winter on turnips or swedes, and experience has shown that the fattening is done much more economically, and with far fewer losses by death when dry foods are given with the roots, and the roots cut and measured out to the sheep. Of course, when about nine months old hoggets lose their front teeth and cannot break whole swedes, and at that time roots must be cut.

During the past five winters the writer has carried out feeding experiments with sheep on turnips, and on the average, the following ration per sheep per week has proved the best, judged by the dressed weight and quality of the sheep when killed:—

lb.		Albds.	Fat.	Carbo-hydrates.
1.—120 Swedes ...	=	1·56	·12	12·72
4 Hay ...	=	·22	·04	1·63
2 Oats ...	=	·16	·09	·89
2 Linseed Cake	=	·49	·19	·60
			·44 × 2·4 =	1·06
		2·43		16·90

Ratio 1 to 6·9.

The average weight of these hoggets (7 to 8 months old) at starting has been 97 lb., and during 10 weeks they have

increased at the rate of $2\frac{3}{4}$ lb. per head per week in live weight. Although all the foods were weighed, they were allowed hay and swedes *ad lib.*, so that to a certain extent they fixed their own ratio. When an equal weight of decorticated cotton cake took the place of the linseed cake, and maize of the oats—a rather cheaper diet—the live weight increase was slightly higher, but the percentage of dressed weight to live weight was lower. Where sheep have been fed in sheds the rate of increase has been even more rapid under the same feeding.

When hay, oats, or linseed cake are dear, either of the following will be found good and cheaper rations :—

lb.		Albds.	Fat.		Carbo-hydrates.
2.—120 Swedes	=	1·56	·12		12·72
3 Hay	=	·16	·03		1·22
5 Dried Grains ...	=	·75	·32		1·70
			·47 × 2·4	=	1·13
		2·47			16·77

Ratio 1 to 6·8.

lb.		Albds.	Fat.	Carbo-hydrates.
.—120 Swedes	=	1·56	·12	12·72
5 Oat or Barley Straw ...	=	·07	·04	2·00
2 Hay	=	·11	·02	·81
2 Decorticated Cotton Cake	=	·74	·20	·37
			·38 × 2·4	·90
		2·48		16·80

Ratio 1 to 6·8.

Chaff the straw and hay, damp and mix with a little treacle dissolved in hot water.

lb.		Albds.	Fat.		Carbo-hydrates.
4.—135 Swedes	=	1·76	·14		14·31
4 Oat Straw Chaff ...	=	·06	·03		1·60
$3\frac{3}{4}$ *Rough* Cotton Cake	=	·68	·22		·66
			·39 × 2·4	=	·94
		2·50			17·51

Ratio 1 to 7.

The straw chaff may be made more relishing by damping with treacle-water, as with the last ration.

In experiments conducted by the Royal Agricultural Society at Woburn excellent results were produced with older sheep by means of the following ration per sheep per week :—

5.—140 lb. Swedes
2 „ Hay
5 „ Whole Wheat

which gives a slightly wider albuminoid ratio than either 1, 2, or 3 above named. Grain must be given to sheep whole, not as with cows in the form of meal.

The following sheep-feeding trials, also carried out at Woburn, are instructive from many points of view, though their original purpose was to determine the relative values in the sheep's diet of rough fodders and dried grains. The sheep were fine Hampshire Down hoggs, each weighing on an average in each lot 123 lb., and the feeding trial lasted 23 weeks :—

	Consumed per head per week.	Albd. Ratio.	Gained per head per week.
Lot 1.	176 lb. Roots ... ... $2\frac{1}{2}$ „ Oat Straw Chaff $4\frac{1}{3}$ „ Linseed Cake ...	1 to 6·7	2·83 lb.
Lot 2.	173 „ Roots ... ... 2·4 „ Hay ... ... $4\frac{1}{3}$ „ Linseed Cake ...	1 to 6·5	2·97 „
Lot 3.	174 „ Roots ... ... 2·6 „ Oat Straw and Hay Chaff ... $4\frac{1}{3}$ „ Linseed Cake...	1 to 6·6	3·03 „
Lot 4.	171 „ Roots ... ... $2\frac{3}{4}$ „ Dried Grains ... $4\frac{1}{3}$ „ Linseed Cake...	1 to 6·1	2·86 „

These results plainly show that narrowing the albuminoid ratio by the substitution of dried grains for hay or straw was an expensive proceeding in both directions, for the initial cost of the food was much greater, and the rate of increase was less. Other experiments have also shown that a further widening of the ratio by replacing about one-third of this quantity of cake with corn or hay, makes the feeding more profitable, and practically reduces these rations to something like the nutritive standard of Rations 1, 2 and 3. The rate of increase in weight of each lot was highly satisfactory, though that of Lot 3 was the most rapid, and this lot proved the most profitable from every point of view. When the weight of the sheep and the food consumed by this lot and those fed on Ration 1 above described respec-

tively are compared, it will be seen that the latter at less cost made quite as satisfactory progress. The ration of Lot 3 works out as follows :—

lb.		Albds.	Fat.	Carbo-hydrates.
6.—174	Roots ... ... =	2·25	·17	18·33
2·6	Oat Straw and Hay Chaff ... =	·09	·04	1·05
$4\frac{1}{3}$	Linseed Cake ... =	1·07	·52	1·30
			·73 × 2·4 =	1·75
		3·41		22·43

Ratio 1 to 6·6.

It is interesting also to compare the results of the sheep-feeding trials of the Highland and Agricultural Society of Scotland with those above described. The hoggs were much smaller—black-face and Leicester cross—than those concerned in the writer's and the Woburn trials, and the experimental feeding lasted 15 weeks. There were 20 sheep in each lot.

Av. Weight.	Food per Wk.		Albd. Ratio.	Increase per Wk.
Lot 1.—80·4 lb.	Turnips ... Hay	103 lb. 4·8 ,,	1 to 6·2	1·47 lb.
Lot 2.—81· ,,	Turnips ... Hay ... ... Und. Cot. Cake	99 ,, 3·3 ,, 5 ,,	1 to 4·3	2·44 ,,
Lot 3.—77·8 ,,	Turnips ... Hay ... ... Und. Cot. Cake and Maize ...	90 ,, 3·6 ,, 5 ,,	1 to 5·2	2·55 ,,
Lot 4.—79·5 ,,	Turnips ... Hay ... ... Maize	81 ,, 3·6 ,, 5 ,,	1 to 7·1	2·33
Lot 5.—80·5 ,,	Turnips ... Hay ... ... Dried Grains ...	89 ,, 2·8 ,, 5 ,,	1 to 4·6	2·66 ,,
Lot 6.—79·7 ,,	Turnips ... Hay ... ... Linseed Cake ...	90 ,, 3·5 ,, 5 ,,	1 to 4·1	2·58 ,,
Lot 7.—80·7 ,,	Turnips ... Linseed Cake ...	90 ,, 5 ,,	1 to 3·8	2·49 ,,

All had turnips and hay *ad lib.* except in the case of Lot 7.

These figures speak for themselves as to results, Lot 1 doing the worst by a long way, and Lot 5 the best, closely followed by Lots 6 and 3. It is difficult from this trial to draw any decided

conclusions for the compounding of sheep rations, for the results in no way correspond either to the *quantity* of food consumed or the *quality* as indicated by albuminoid ratio, or *quantity and quality* combined ; but at least it may be said that the ration most similar to Nos. 1, 2 and 3 above recommended succeeded in raising the lightest lot of sheep (Lot 3) to nearly the top place. It will be observed that for the weight of the sheep the quantities consumed accord closely with those of the other trials referred to.

RATIONS FOR PIGS.

The following rations have been used with pigs fed from 10 weeks old, for a period of 18 to 20 weeks, and making from 16 to 18 stones dressed weight. Each has an albuminoid ratio of 1 to 6, and consists of foo-dstuffs ordinarily used in pig feeding to meet varying farm conditions.

1. 6 lb. of maize meal to 1 gallon of separated milk.
2. 2 lb. of maize meal to 1 lb. of pea meal.
3. 6 lb. of middlings to 1 lb. of pea meal.
4. 6 lb. of boiled potatoes, 3 lb. of ground oats, to ½ gallon of separated milk.
5. 5 lb. ground oats, 1 lb. pea meal to 1 gallon of whey.

The meal is scalded in quantity, and mixed with separated milk, whey, or water as the case may be, at the time of serving. The pigs are fed three times a day with as much as they will "clean up" each time.

RATIONS FOR HORSES.

In France and Germany experiments were conducted for the purpose of ascertaining what constituted a bare maintenance diet for a horse of 1,000 lb. weight when absolutely at rest ; and it was found that 8 lb. of digestible matter, with an albuminoid ratio of about 1 to 8, was sufficient, and good hay alone will give this ratio. As, however, in practice, there are but few days in which farm horses will be kept entirely in the stable, and cart horses are often heavier than 1,000 lb., we may take 10 to 12 lb. as about the maintenance diet of a farm horse when not at field work or carting ; and when ploughing, carting, &c., it has been found that he will require two stones of hay and 12 lb. of oats, which, as will be seen

from the following figures, supplies about 21 lb. of digestible matter, having an albuminoid ratio of 1 to $7\frac{1}{2}$:—

lb.	Albds.	Fat.	Carbo-hydrates.
1.—28 Hay ... ... =	1·51	·28	11·40
12 Oats ... ... =	·96	·52	5·36
		·80 × 2·4 =	1·92
	2·47		18·68

We may therefore say that a full-sized agricultural horse at rest can be satisfactorily fed on hay alone, and when at work will require a diet furnishing him with $2\frac{1}{2}$ lb. of digestible albuminoids and $18\frac{1}{2}$ lb. of digestible carbohydrates. It is economy to chaff hay for horses, as they frequently waste it by littering, when supplied long in the rack, though possibly one given to bolting his food would give it better chewing in the long state. The following ration, on account of containing some bran and of its more complex nature, together with the fact that, the hay being chaffed, waste will be avoided, and the consideration that it is less costly than No. 1, is one of the best rations a farm horse could have :—

lb.	Albds.	Fat.	Carbo-hydrates.
2.—21 Hay Chaff... ... ... =	1·13	·21	8·55
9 Maize Meal ... ... =	·72	·36	6·17
2 Bran ... ... =	·21	·05	·88
2 Beans (crushed) ... ... =	·44	·03	1·00
		·65 × 2·4 =	1·56
	2·50		18·16

Farm horses fed on oat straw and oats alone—the plan followed in the arable districts of Scotland—would require, as a working diet, the following quantities, which supply 21 lb. of digestible matter, having a ratio slightly narrower than 1 to 8 :—

lb.	Albds.	Fat.	Carbo-hydrates.
3.—20 Oat Straw... ... ... =	·28	·14	4·00
26 Oats ... ... =	2·08	1·12	11·62
		1·26 × 2·4 =	3·02
	2·36		18·64

At ordinary market prices this ration would be a trifle dearer than No. 1, but would better suit a farm growing much oats and little hay.

Instead of a ration of hay alone when not at work, the following ration would supply the same quantity of nutrients and be often cheaper :—

		Albds.	Fat.	Carbo-hydrates.
lb.				
4.— 8 Oat Straw } Chaff	... =	·10	·05	1·60
6 Hay }	... =	·32	·06	2·44
5 Maize (crushed) ...	... =	·40	·20	3·43
2 Beans (crushed) ...	... =	·44	·03	1·00
			·34 × 2·4 =	·82
		1·26		9·29

The straw is here taken as only half as digestible as with cattle. This ration gives a fraction more than 10½ lb. of digestible food a day of a ratio rather narrower than 1 to 8. A maintenance ration of hay alone works out from the table as follows :—

		Albds.	Fat.	Carbo-hydrates.
lb.				
5.—23 Hay	... =	1.24	·23	9·36
			× 2·4 =	·55
		1·24		9·91

Mares suckling foals find all they require in the way of food on an early summer pasture; should an indoor ration be required for a mare with a foal, the following is a very suitable one :—

		Albds.	Fat.	Carbo-hydrates.
lb.				
6.—21 Hay ...	... =	1·13	·21	8·55
4 Maize Meal	... =	·32	·16	2·74
5 Oats ...	... =	·40	·21	2·23
3 Bran ...	... =	·32	·07	1·33
3 Beans ...	... =	·66	·04	1·50
			·69 × 2·4 =	1·66
Ratio 1 to 6·3		2·83		18·01

Half the hay might be given long, the other half should be chaffed and mixed with the maize meal and bran damped, and the oats and the crushed beans given dry. It is a safe rule to remember in feeding horses the saying "*old* oats, *old* hay, and *old* beans long crushed."

The foal will graze with the mare and soon share with her any indoor food she may be getting, and thus prepare itself for

weaning. When weaned it should get a little trough food, consisting of oats $\frac{1}{2}$ lb., and linseed cake $\frac{1}{4}$ lb. a day. It would probably be wintered out on the pastures in the day time, and in a shed or well-aired loose box at night; when brought in at night it should be supplied with a rack of hay and one of the following trough mixtures:—(1) 1 lb. of oats and $\frac{1}{2}$ lb. linseed cake or (2) $\frac{1}{2}$ lb. oats, $\frac{1}{2}$ lb. bran and $\frac{1}{2}$ lb. crushed beans.

WM. T. LAWRENCE.

LARCH AND SPRUCE FIR CANKER.

The following remarks bearing on these destructive diseases are the outcome of observations and experiments extending over a period of sixteen years, and conducted in various parts of England extending from Yorkshire to Hampshire.

Only those experiments considered necessary to support the reasons advanced as to the primary causes for the widespread devastation, and the proof that such injury is due to certain fungi are given; fuller details as to methods, &c., will be recorded elsewhere.

Larch Canker.

Dasyscypha calycina, Fuckel, Symb. Myc., p. 305 (1869).

Syn. *Peziza calycina*, Schum., Enum. Pl. Saell., II., p. 424 (1803); *Peziza Willkommii*, Hartig, Unters. Forstbot. Inst. München I, p. 63, Taf. IV., p. 10—20; *Corticium amorphum*, Willkomm; Die mikros. Feinde des Waldes, Heft II., p. 167, 4 pl. (1867).

This destructive parasite is present in greater or less quantity, depending on local conditions, wherever the larch (*Larix europæa*, D.C.) grows. In this country it also occurs on the Scots fine (*Pinus silvestris*, L.) and on the silver fir (*Abies pectinata*, D.C.). It has been met with on young branches of the mountain pine (*Pinus Pumilio*, Haenke), in Southern Europe. Finally, it occurs on the balsam fir (*Abies balsamea*, Miller), in the United States.

D. calycina is a wound-parasite, as proved by the researches of Hartig (1); in other words, it cannot gain an entrance into the tissues of a living tree except through a wound. Respecting the origin and nature of these wounds more will be said later.

Carruthers (2) has recently stated that *D. calycina* is not a wound parasite, but that its spores can penetrate the young uninjured bark of the larch. This idea is not supported by

any account of actual experiments, and is quite contrary to my own experience. One hundred and four inoculations on young unwounded branches of larch, in some instances seedlings, in others old trees, extending over several years, made at different seasons and under varied conditions, by using fresh ascospores which germinated readily in water, invariably resulted in failure to infect the branch experimented upon. The same failure attended eleven experiments of inoculation with the conidia of *D. calycina.*

On the other hand, inoculation by means of placing ascospores, or mycelium contained in either wood or resin, on a wounded surface, almost invariably resulted in establishing the disease, the only accepted evidence being the production of conidia or ascophores.

Branches two or three years old are most susceptible, and out of numerous experiments I have never succeeded in inoculating a branch when more than five years old.

Quite young trees—under ten years—are much more readily inoculated than older trees, although I have sometimes succeeded in inoculating young branches of very old trees.

I have never succeeded in producing canker by using the conidia (=spermatia of some authors) of the fungus for inoculation purposes, even when deposited in quantity in a protected wound; nevertheless, the conidia germinate freely when placed in contact with a very thin section of larch bark in a hanging drop (Fig. 6). The ascospores also germinate and push out strong germ-tubes under similar conditions (Fig. 7).

Hartig (1) who like Willkomm (3) figures the conidia as elliptical, whereas I find them to be perfectly globose, did not succeed in causing these bodies to germinate, and states distinctly that the conidia are incapable of infecting the larch; this statement is repeated by Marshall Ward (4). Although, as already stated, I have never succeeded in producing canker by inoculation with conidia, yet the fact that these bodies do germinate, and their constant presence along with the cups or ascophore form of fruit on canker wounds, seem to suggest that possibly they may under certain undiscovered conditions, be the cause of the disease. The conidia-bearing pustules

are very minute and of a dull yellow colour, and although by no means rare, are apt to be overlooked unless specially searched for (Figs. 2—3, Pl. I.).

Wounds for artificial infection were usually made by inserting the point of a lancet quite through the bark to the cambium zone, exercising at the same time a little lateral pressure so that a small crack about two lines long was made. Into this wound either ascospores or mycelium were introduced. When the weather was very warm and dry the inoculated wounds were protected for a week by a covering of oiled paper to prevent too rapid drying. The first indication of the success of an inoculation was usually manifested during the sixth to eighth week after the experiment, when the outer dead bark became cracked and raised, due to accelerated growth of the living cortex underneath; and at the expiration of about ten weeks a few pustules of conidia, accompanied by a small number of usually imperfectly developed ascophores, appeared if the weather continued moist; but, as a rule, it was not until the following year, in April or May, that well-formed cups were produced.

In addition to the kind of wound described above, I have proved by repeated experiments that a pin-prick makes a wound sufficiently large for the purpose of a successful inoculation, if spores are placed in the drop of liquid oozing out of the wound.

May is the month during which artificial infection takes most readily, and I imagine that the same holds good in a state of nature, for the following reasons. Well-developed ascophores are most abundant during this month, and there is a superabundance of sap which readily oozes to the surface through the smallest puncture it is possible to make with a fine needle. In this extruded sap the ascospores readily germinate and enter the living tissues of the tree.

The large percentage of instances where the canker appeared only at the point of artificial inoculation proved that the disease was in reality the outcome of such inoculation; nevertheless, in two instances where four-year-old larches, growing in pots, and obtained from a locality where the disease was supposed to be entirely absent, were inoculated, I was surprised to find that in one tree the canker appeared simultaneously at three different

points, two of which had not been artificially inoculated; and that in the second tree, artificial inoculation produced no result, but the canker appeared on another part.

The only explanation that can be suggested is that, in this instance, the disease must have existed in the locality where the trees were raised, and that infection had taken place from floating spores before the trees came into my possession.

That the ascospores when expelled from the asci in the cup do actually float in the atmosphere, was definitely proved by the following experiment, which was repeated on several occasions. Ordinary glass slips used for microscopic purposes, having about a square inch of their surface on one side smeared with dilute glycerin, which does not dry up when exposed to the air, were suspended by means of thread, at distances varying from 6 to 18 inches from cankered spots bearing well-developed ascophores. Examined after twelve hours' exposure numerous spores were found entrapped in the glycerin, which on being placed in suitable medium germinated readily. Similarly prepared slips of glass suspended haphazard in a plantation where canker abounded also caught floating spores. No conidia were observed on any of the slides.

The wounds occurring in nature through which inoculations take place may be grouped under four headings: (A) wounds caused by wind, or by snow resting on the branches; (B) extrusion of sap caused by late frosts; (C) nibbling of the cortex by insects, and more especially the punctures made by the larch aphis (*Chermes laricis*, Hartig); (D) wounds made near the base of the stem when planting young trees.

As a broad rule, it may be stated, that when trees under ten years of age are attacked by canker, they are either killed outright, or are so deformed that if they continue to grow, they are of very inferior value from an economic standpoint. The reason for this is that in the case of seedlings or very young trees, the main stem is the part usually attacked, whereas in older trees the bark of the trunk becomes so rigid that it is impervious to the punctures of aphides, and it is not so readily influenced by frost; and the only chance of admission to the cambium of the trunk is when branches are either broken off or more or less cracked at the point where they leave the trunk.

I have constantly observed that in the month of May—when practically all infection occurs—the proportion of sap is much greater in seedlings and quite young trees than in old ones. What I mean exactly is this, that if branches of equal age of a young and an old tree are wounded by inserting a needle or a lancet, sap oozes to the surface in the case of the young tree, but not in the old one.

It is this sap that retains floating spores, and also serves as a nutrient solution in which they readily germinate.

Commencing with the causes which lead to the development of canker in seedlings and young trees, the larch aphis (*Chermes laricis*, Hartig) is most responsible; in fact, I consider it to be no exaggeration to state that if the aphis could be obliterated, larch canker, as a destructive epidemic, would cease to exist in this country. As to whether the interdependence between aphis and canker holds good in other countries, I am not in a position to state.

During the early part of May, it is not at all unusual to find the axils of many dwarf branches on the stems of seedling and young larches each occupied by an aphis "foundress" and her stalked eggs. Now, as to whether the foundress actually punctures the bark at this point or not, I have not been able to determine, but there is always a certain amount of moisture on the bark where a foundress is located, and I have repeatedly produced canker by placing ascospores underneath the foundress.

Situated on the bark quite near to each foundress is a small patch of white flocculent matter, the centre of which is occupied by a fairly large drop of sap. As evaporation proceeds after two or three days, the resinous portion of the sap alone remains and becomes solid (Fig. 5, Pl. I.). If spores are placed in this drop when first extruded, and in a liquid condition, canker follows.

The significance of this white fleck with its central drop of plant sap I have not been able to determine. Its constant presence is alluded to by Buckton (5), who also figures it, without comment or explanation. The one important feature in this connection is to remember that it is a channel through which inoculation can take place.

Professor Marshall Ward (4) considers that late frosts are to a great extent responsible for the prevalence of canker in larch. I have once observed in the middle of May, a time when seedlings and young larches are replete with sap, that after a sharp frost, followed by bright sunshine, the branches were studded with minute drops of sap, which eventually hardened into resin. Ripe ascospores were not forthcoming at the time when this observation was made, but I can readily conceive that canker would have resulted if spores had been deposited on the freshly extruded beads of sap.

Owing to the comparative paucity of sap in the branches of old trees, a May frost would not be so likely to result in injury.

In the case of young trees, infection often takes place just above the ground line, and is thus explained by Dr. Somerville (8). "Not only is infection specially liable to occur low down on a stem on account of the abundance of moisture, but the chances of an outbreak of disease at such a place are also favoured by the frequent presence of wounds near the surface of the ground. These wounds may be caused by lifting the plants from the nursery beds, or they may be formed by the feet or the tools of the workmen during planting. Where trees are planted by 'notching' the turf is firmed round the base by the repeated application of the heel of the planter, and in doing so it not unfrequently happens that the boot comes in contact with the stem and abrades the bark. And should the plant escape injury during planting, it is still very likely to be injured near the ground by rabbits, hares, voles and other animals."

For the reasons already stated, the trunks of trees over 10 years of age are practically safe against attack from canker, except near the apex, and there the drier air does not favour the earliest stage of inoculation so much as the damper conditions that prevail near the ground. If the trunk escapes the disease, canker attacking the branches at a later stage does not, as a rule, interfere with the continued growth and development of the tree.

The cup or ascophore varies considerably in size, ranging from two to five millimeters, externally snow-white, and minutely hairy under a pocket-lens; the disc varies from deep orange to

red. The cup is not distinctly stalked, but is somewhat narrowed at the point of attachment. The spores are variable in size, ranging from 18—25 × 6—8 μ; paraphyses longer than the asci (Fig. 2, Pl. II.).

The characteristic appearance of canker caused by the fungus is sufficiently familiar to most of those interested in the subject as to require no detailed description. Fig. 1, Pl. I., shows a typical canker of small dimensions, with the fungus—ascophores and conidia pustules—natural size.

The mycelium of the fungus is most abundant in the cortex and cambium region, but it also enters the wood (Fig. 26, Pl. III.).

In the great majority of instances, canker commences on a very young stem or branch, in the axil of a dwarf shoot, which was presumably occupied by an aphis "foundress," as already described. Again, when canker is present on a thick trunk or branch, there are almost invariably the remains of a dead branch in the centre of the canker depression. In the axil of the dead branch, which had been partly cracked away from its origin by snow or wind, the spores of the fungus first found an entrance into the then living tissues.

In addition to the larch and Scots pine, I have also succeeded in producing canker by artificial inoculation on branches of the Siberian larch (*Larix sibirica*, Ledeb.), and the Japanese (*Larix leptolepis*, Endl.).

In the last named inoculation was only effected after much perseverance, and on a seedling placed under conditions very favourable for the inception of the disease. It is quite possible that the Japanese larch would prove immune when growing in the open in this country.

SPRUCE CANKER.

Dasyscypha resinaria, Rehm, Ascom. Lojk. No. 30 (1882).

Syn. *Peziza resinaria*, Cooke and Phil., *Grevillea*, III., 185 (1875).

This parasite appears to be local in its distribution in Britain, but owing to the fact that to the naked eye, and even when examined with a pocket-lens, it is practically indistinguishable from the fungus causing larch canker, and as it

has been generally considered that the last-named disease was always due to the presence of *Dasyscypha calycina*, it is quite probable that *Dasyscypha resinaria* is frequently passed over as *D. calycina*.

In this country *D. resinaria* is most frequently met with on the spruce (*Picea excelsa*, Link), and has occurred in Shropshire, Yorkshire, Surrey, and Hants. It is also not uncommon on the larch (*Larix europœa*, D.C.), where it occurs either alone or in company with *D. calycina*. Quite recently *D. resinaria* has proved very destructive to the Bhotan pine (*Pinus excelsa*, Wall.) in Wiltshire.

On the Continent *D. resinaria* has been recorded from Germany and Hungary, a parasite on the spruce fir; whereas in the United States this fungus causes great injury to *Abies balsamea*, Mill.

Like *D. calycina*, *D. resinaria* is a wound parasite, and is frequently enabled to enter the tissues of a living tree through wounds made by another minute parasitic fungus, a species of *Exosporium* (Figs. 20—25).

I have proved by carefully-conducted inoculation experiments on seedling spruce, that the *Exosporium* is a true parasite; its spores, when placed on the open bark of seedlings or the young branches of old trees, can germinate and pierce the bark and pass into the inner actively-living tissues, provided the atmosphere remains damp, until the spores have germinated and the germ-tube passed into the interior of the branch.

About three months after inoculation the fruit of the *Exosporium* appears on the surface of the bark under the form of numerous minute black dots, as seen by the naked eye. About this time the bark of the branch in the neighbourhood of the fungus becomes cracked, and the cracks, which always remain narrow, are filled with resin. It is through these resin-filled cracks that the germinating spores of *Dasyscypha resinaria* find their way into the interior of the living tree.

In addition to the cracks made by *Exosporium*, the *Dasyscypha* spores germinate on resin oozing to the surface through wounds caused by *Chermes abietis*, L., or by various mechanical injuries, similar to those mentioned under larch canker.

The general appearance of spruce canker is similar to that

of larch canker; nevertheless, with practice it is possible to distinguish between the two, by naked eye characters.

Soon after infection the outer bark is broken up into fragments which fall away, owing to the pressure exerted by the rapidly growing inner bark, which becomes hypertrophied. With age the original depression in the bark caused by the fungus increases in size, but there is more swelling round the edges of the wound than is the case in larch canker, and the wound is more inclined to completely girdle the branch attacked. The flow of resin is much more copious than in larch canker, and large gum-pockets are formed in the wood, filled with hardened resin, which on examination is found to be permeated with the mycelium of the parasite. Resin canals are formed in considerable numbers in the wood near the wound, and the resin also often fills the cells lining the resin canals.

In the United States the injury done by *Dasyscypha resinaria* appears to be much more serious than it is with us at present. It is thus described by Anderson (6).

"On some trees (*Abies balsamea*) almost every knot and dead branch was surrounded by one or more of these canker swellings, the canker not infrequently extending all around the tree trunk or branch. When younger stems or branches were affected in this way the portion above the canker, and often the whole stem, had been killed by the girdling. . . . Infection takes place, as a rule, around the base of the imperfectly self-pruned branches of the lower part of the trunk. At these places the spores gain access to the inner living bark and to the cambium where they germinate and cause the increased growth of the wood and secondary cortex. Wounds caused by insects and by hail and by the breaking of the branches by snow and ice, also expose the cambium to the fungus spores."

The ascophore or cup of the fungus in *D. resinaria* is somewhat smaller than in *D. calycina*, more distinctly stalked, and with a yellow or pale orange, not orange-red disc; externally white or tinged grey, minutely velvety under a pocket-lens. Conidial form minute, dull orange. (Fig. 4, Pl. I.). The essential specific characters of the present species are the very minute, subglobose spores, averaging 3×2—$2 \cdot 5$ μ.; conidia elliptic-oblong, 2×1 μ.

Both ascospores and conidia germinate freely when placed in contact with a thin section of cortex or wood of the host-plant in a hanging drop.

Successful inoculations resulting in the production of ascophores have resulted from introducing a fragment of mycelium enclosed in resin into punctures in larch and spruce. Ascophores also followed the placing of ascospores in the minute cavity occupied by *Chermes laricis* on *Larix sibirica*, Ledeb.

In addition to *Dasyscypha calycina* and *D. resinaria*, certain other species belonging to the same genus, and bearing a close superficial resemblance to *D. calycina*, occur on various conifers; and judging from the appearance of the wound produced, may be considered as wound-parasites.

Dasyscypha subtilissima, Cooke, has been observed on *Abies pectinata*, D.C., and *Larix europæa*, D.C., in Britain, France, Germany, and the United States.

Dasyscypha calyciformis, Rehm, has been shown by Wagner (7) to be parasitic on *Pinus silvestris*, L., *Abies pectinata*, D.C., and *Picea excelsa*, Link, in Germany.

Probably the North American *Dasyscypha Agassizii* Sacc., growing on *Abies* sp. should be included here.

SUMMARY.

The larch is most susceptible to canker when quite young, and as the fungus spores in the majority of instances gain an entrance to the living tissues through injuries caused by the larch aphis *Chermes laricis*, Hedwig: it follows that seedlings and young trees should be protected against this pest. This can be accomplished by spraying in the spring with paraffin emulsion, prepared as follows:—Dissolve half a pound of soft-soap in two gallons of hot water, then add two gallons of paraffin and mix thoroughly until the ingredients do not separate on standing. One gallon of the emulsion thus prepared should be diluted with fourteen gallons of water, when it is ready for use.

Recent investigations tend to show that the spruce-gall aphis (*Chermes abietis*, L.), and the larch aphis (*Chermes laricis*, Hartig), are alternating stages of one species. The sexual generation occurs only on the spruce, the agamic generations,

consisting entirely of females, then migrating to the larch. Under the circumstances a mixture of spruce and larch is not to be recommended, as it furnishes the aphis with its two necessary host-plants.

As a safeguard against inoculation taking place through bark fissures caused by late frosts, it is advisable not to form seed-beds nor to plant larch in low-lying damp localities, where not only are the plants most exposed to frost, but such situations also favour the presence of the aphis.

In the case of larger trees there is no cure. If the trunk is not seriously injured the tree may continue to grow and make wood for many years after being cankered. However, it is very important to remember that the toleration of canker-bearing ascophores is a serious menance to surrounding trees. As the spore is the only known means of transmitting the disease from one tree to another in a state of nature, therefore, whenever practicable, all canker wounds should be cut away, and the removed portions burned. Protect the cut surface with a coating of gas-tar.

In this country ascophores of the fungus are formed everywhere in abundance, independent of altitude.

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DESCRIPTION OF THE FIGURES.

Plate I.

Fig. 1. Portion of stem of a young larch, showing a small canker wound with ascophores or cups of *Dasyscypha calycina*. Nat. size. (The result of artificial inoculation.)

Fig. 2. A small but characteristic canker, with ascophores and conidia-pustules of *D. calycina*. Nat. size.

Fig. 3. Ascophores and conidia-pustules of *D. calycina* × 35.

Fig. 4. Ascophores and conidia-pustules of *Dasyscypha resinaria*, × 35.

Fig. 5. Portion of a larch branch showing the white flocculent tuft with a central drop of sap, which is constantly located near to a "foundress" aphis when with her eggs, × 5.

Plate II.

Fig. 1. Section through an ascophore of *Dasyscypha calycina*, × 40.

Fig. 2. Asci containing spores, also paraphyses, of *D. calycina*, × 400.

Fig. 3. Section through an ascophore of *D. calycina*, showing the mycelium of the fungus permeating and rupturing the bark and cortex, × 400.

Fig. 4. Section through a conidial-pustule of *D. calycina*, × 50.

Fig. 5. Conidiophores and conidia of *D. calycina*, × 1,200.

Fig. 6. Conidia of *D. calycina* germinating in contact with a thin section of larch bark in a hanging-drop, × 1200.

Fig. 7. Ascophores of *D. calycina* germinating in contact with a thin section of larch bark in a hanging-drop, × 400.

Fig. 8. A single spore of *D. calycina* germinating; the germ-tube has penetrated the wall of the cell through a bordered pit, × 400.

Fig. 9. Ascus containing spores, also paraphyses, of *D. calycina*, var. *Trevelyani*, Cooke. A variety distinguished by the spores being larger than in the type form, × 400.

Fig. 10. Section through ascophore of *Dasyscypha resinaria*, × 40.

Fig. 11. Asci, spores, and paraphyses of *D. resinaria*, × 400.

Fig. 12. Section through ascophore of *Dasyscypha subtilissima*, × 40.

Fig. 13. Asci, spores, and paraphyses of *D. subtilissima*, × 400.

Fig. 14. Sections through ascophore of a minute white *Dasyscypha*. Sometimes occurring along with *D. calycina*, × 80.

Fig. 15. Asci, spores, and paraphyses of ascophore described under Fig. 14, × 400.

Plate III.

Fig. 16. Section through conidial-pustule of *D. resinaria*, × 100.

Fig. 17. Conidiophores and conidia of *D. resinaria*, × 1,200.

Fig. 18. Conidia of *D. resinaria* germinating, × 1,200.

Fig. 19. *Exosporium* sp. on a larch branch, showing the cracks in the bark, caused by the parasite. Nat. size.

Fig. 20. Conidia of the *Exosporium*, × 1,200.

Fig. 21. Portion of a conidium of *Exosporium*, showing continuity of protoplasm between adjoining cells, × 2,000.

Fig. 22. *Exosporium* cells germinating, × 1,200.

Fig. 23. Entire plants of *Exosporium*, × 50.

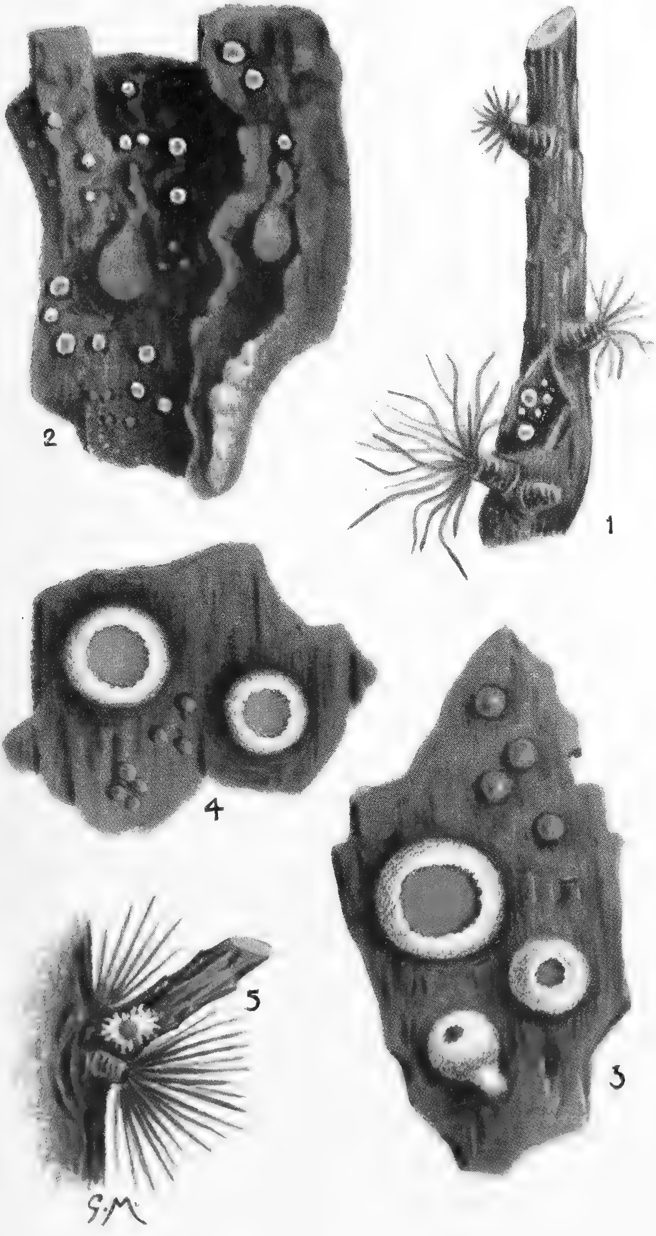
Fig. 24. Section of plant of *Exosporium*, × 80.

Fig. 25. Larch branch showing canker caused by *Dasyscypha resinaria*. The *Exosporium* is still present round the edge of the wound. Nat. size.

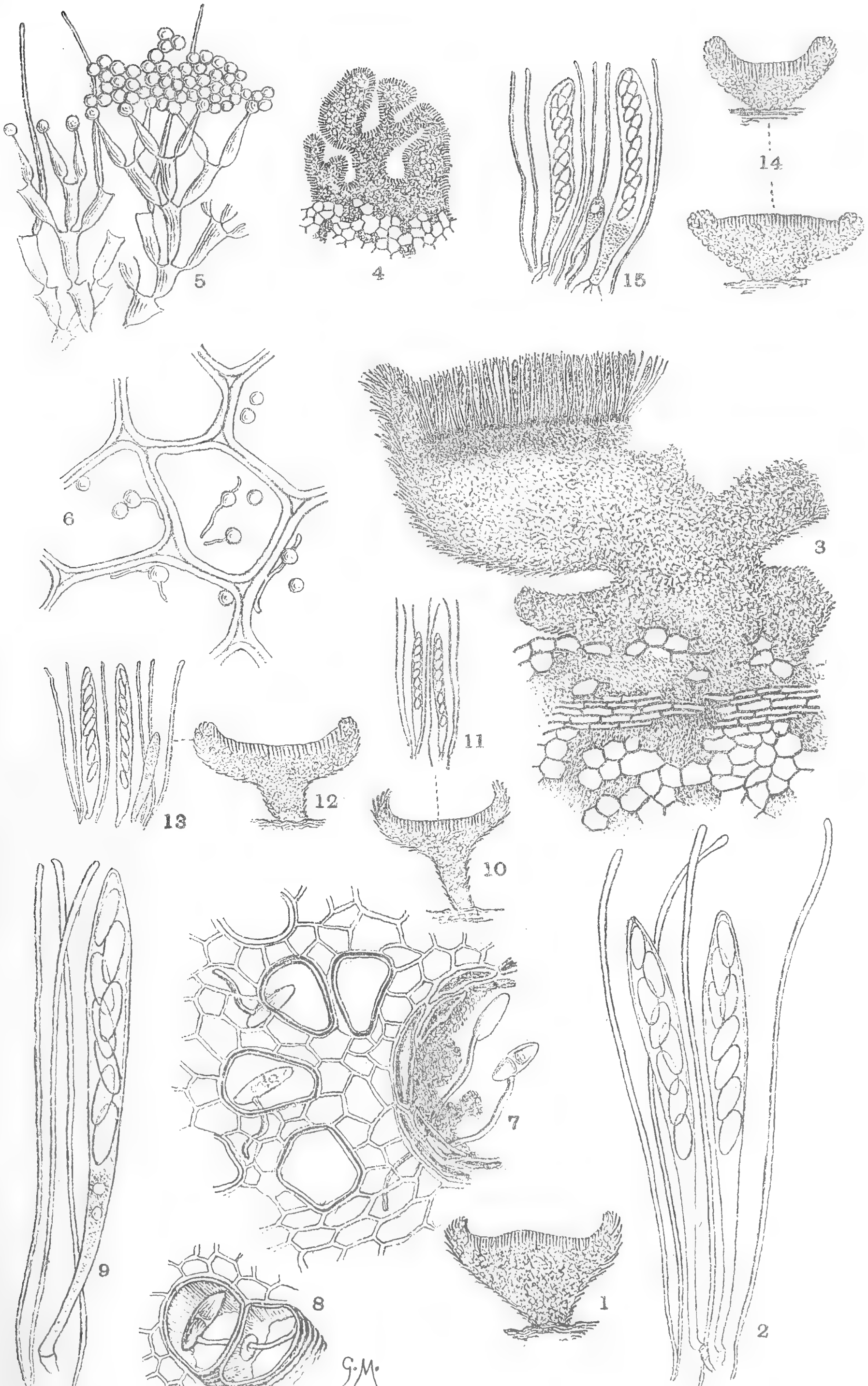
Fig. 26. Section through larch wood showing hyphæ of *Dasyscypha calycina* in the cells, × 1,200.

Fig. 27. Part of a larch branch showing an aphis "foundress" nestling in the axil of each dwarf shoot. Nat. size.

GEO. MASSEE.



LARCH AND SPRUCE CANKER.



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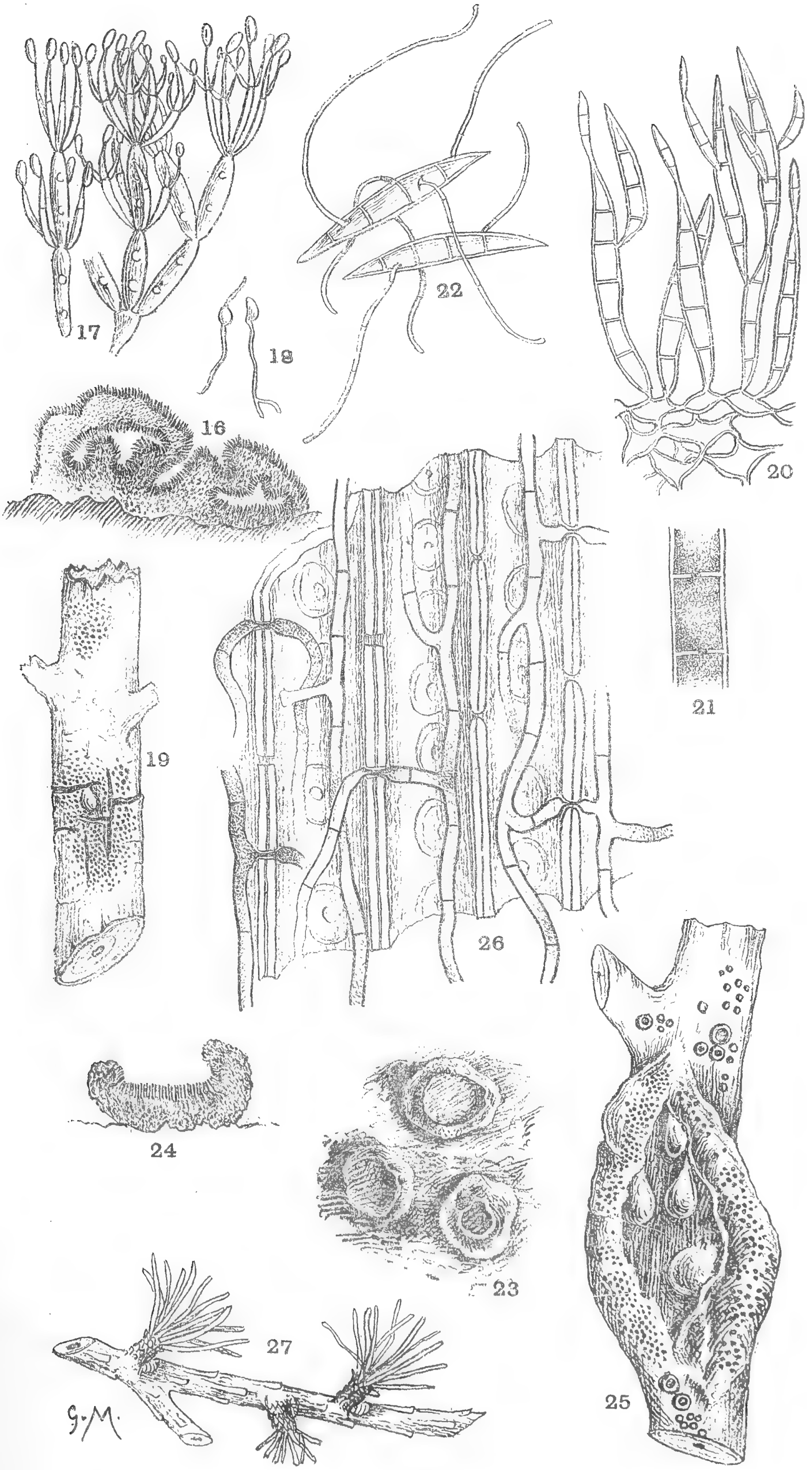


LARCH AND SPRUCE CANKER.

LIVER DISEASE (TUBERCULOSIS) OF POULTRY.

Liver disease, which is the name usually given to tuberculosis in birds, is one of the most common diseases of fowls, turkeys, pheasants, partridges, grouse, pigeons, and other birds. Dr. J. Bland Sutton found this disease to be a common cause of death amongst the birds at the Zoological Gardens, and, as the result of an examination of more than a thousand birds of various species, he was able to say: "The birds which are almost exclusively affected by this disease are those which live on seeds, grain (meaning by grain, barley, maize, oats), and fruit. I have only twice observed it in flesh-eaters. Those which live on fish are exempt from it."

It is, without exception, the most common cause of loss to poultry owners in most parts of England and Scotland, and I have recently learned from a correspondent that it prevails all over Ireland.

It is evidently just as common on the Continent; it is well known likewise in the United States and in Canada, though in the latter country the nature of the disease does not appear to be understood. Reports show that it occurs in Queensland The disease, therefore, may be said to be world-wide in its distribution.

Symptoms.

In very many places the disease claims a victim with pertinacious regularity, but towards the end of the year and during the winter the death-rate often becomes alarming. The affected fowls become thin and emaciated, losing greatly in strength and weight, and they frequently also are more or less crippled. The appetite is impaired, they are usually off their food or feed in an erratic manner, and diarrhœa is usually

persistent. The comb and wattles are pale and dry, and the mucous membranes are pale, wherever visible. The birds leave off laying soon as a rule. As a result of the extreme emaciation, which is usually the most important and general characteristic, the bones become very prominent, and the effect may be best judged by passing the hand over the keel of the breast bone.

Anatomical Symptoms.

On opening the bird the owner will find that the external appearances of thinness of the muscles are borne out by taking off the skin. The muscles are pale in colour, thus adding further testimony to the symptoms already noted of anæmia, but the most important and characteristic appearances are seen in the body cavity. The liver is brown in colour, sticky to the touch, and dotted all over with small white spots, or larger spots or patches of a white grey or yellow colour. Lifting up the gizzard the spleen is almost certain to be found to be affected. It is usually enlarged and beset with small or large tubercles, which frequently project as fat-like tumours from its surface. The intestine and the lymphatic glands of the mesenteries are also often the seats of similar deposits. Tubercles sometimes occur in the skin and the joints, and the local swellings may then be seen externally, and affect the movements of the bird. The other organs of the body, as a rule, are not affected. As a result of the weakness produced by the disease the poultry are more liable to parasitic invasion, and nematode or round worms may be got, for example, in nearly every case, at the blind ends of the cæca.

Cause.

In 1883 Dr. Heneage Gibbes reported on specimens sent to him by Dr. J. Bland Sutton that the tubercles contained bacilli which were indistinguishable from those of tuberculosis. The truth of these observations has since been confirmed by investigations made at home and abroad.

The exciting cause of the disease, then, is a bacillus which may be considered a variety of the bacillus of mammalian tuberculosis. It gains entrance in practically every case with the

food or by means of fæces of affected birds, and perhaps also by infected material derived from tuberculous human beings and from cattle. The latter sources of infection, however, are not so important as the former. The tendency to the disease is inherited.

Prevention.

The present prevalence of the disease in this and other countries is due to the equally widespread ignorance as to its nature. The general belief is that it is caused by feeding on too starchy foods. It is common, however, in places where the feeding is more satisfactory and includes a liberal supply of oats. The birds which die of the disease are usually thrown on the dung-heap at a farm, and as the fowls have commonly the run of the place they may often be infected by this means. But the most frequent source of infection is the poultry-house or yard which receives the droppings from affected birds containing the bacilli, and the conditions as regards cleanliness, damp, and absence of sunlight are frequently such as to greatly favour the spread of the disease.

The stock at a place affected with liver disease may be divided into the resistant and the non-resistant. The breeding tends to be done more from the former than the latter, and this natural process of making the stock stronger would be greatly assisted by the owner burning or deeply burying the birds which have died and improving the condition of the survivors.

To exterminate the disease, however, something more than that is required. A house should be built with a run in a corner of a field apart altogether from the old poultry-yard. Then carefully choose the strong and healthy birds, put them in the new house, and if any of them show the least indication of disease they should be at once removed and the house disinfected with chloride of lime ($\frac{1}{4}$ lb. to 1 gallon water), or quicklime, or any other good disinfectant. The resistant birds will in this way be separated from the weaker, and will form a foundation for not only a disease-free but a disease-resisting stock.

The hens which have been left should be killed, with the exception, perhaps, of those about which a favourable doubt may exist, and which may be kept in quarantine and carefully

fed in a separate disinfected place. The old house should receive several applications of a thorough disinfectant, and many months should elapse before the birds are brought back again. Periodical disinfection, cleanliness with regard to house, food and water, good ventilation, and the access of sunlight will largely promote the health and vigour of the stock.

Cure.

It is probable, as is the case with mammalian tuberculosis, that cure will often result from improved conditions and removal from fresh sources of infection, and should a cure be attempted that is the only direction which it should take.

ALEX. MEEK.

GRAZING IN ORCHARDS SPRAYED WITH POISONOUS WASHES.

Poisonous solutions are used on the farm for various purposes, such as the destruction of animal parasites (sheep dips), the prevention and cure of animal diseases (copper sulphate in the treatment of foot rot), the destruction of weeds ("weed killers" and sprays for destroying charlock), the destruction of insects on plants (fruit tree "washes"), in the form of poisoned baits for the destruction of injurious insects (scattering poisoned clover, lucerne, &c. over fields for the destruction of surface caterpillars). Poisons are also used in other forms, for instance as powder (hellebore), or vapour (cyanide of potassium fumes).

Though cases have been recorded of animals having died through eating grass contaminated by the dripping of recently-dipped sheep, and it is conceivable that injury might also arise when copper sulphate is employed as a foot dressing without due precaution, yet with ordinary care the poisoning of pasture in this way should be impossible. There is no recorded case, so far as is known, of injury having been caused to live stock by their breaking into fields where the crop has been recently sprayed with a solution of copper sulphate.

"Washes" applied to standard fruit trees can only, except by accident, get into the system of animals in large quantities, when the ground underneath the trees grows a crop of grass or other fodder crop on which some of the solution may fall and be eaten with the crop. How much of the solution may reach the ground will depend upon a variety of circumstances, such as the quantity of "wash" applied, the state of foliage, the density of stocking of the trees, &c. These factors are difficult

to estimate, but it might appear probable, under certain circumstances, at least, that herbage in orchards treated with arsenious compounds, such as "Paris Green" or "London Purple," might become so poisoned as to be dangerous to live stock, although no case of such poisoning appears to have been recorded.

That no evil results would follow this method of destroying orchard pests had been already anticipated, and this had, in fact, been experimentally tested in the United States, where Professor Snow sprayed clover with an ordinary Paris Green wash and then immediately fed his horse on it without any ill effects.

In view, however, of the great increase in recent years in the practice of "spraying" in this country, the Board of Agriculture considered it desirable to make arrangements with the South-Eastern Agricultural College, Wye, to investigate the matter, and an experiment to test the effect of pasturing stock in an orchard sprayed with an arsenical solution was accordingly carried out during the past season by that College.

On May 23rd, 1902, two acres of young fruit trees were sprayed with Paris Green; not only were the trees thus treated but the grass between the trees was also sprayed. The wash used was prepared by mixing 3 lb. of Paris Green (Blundell's paste) and 3 lb. of lime with 600 gallons of water. About 3 lb. of Paris Green was thus sprayed over the two acres, 600 gallons of wash being put upon the trees and ground, which is rather more than would have been normally employed, and considerably more of the wash went on the grass than would have been the case in an older orchard, or where hand machines were used for young trees.

The machine used was a one-horse "Mistifier," which sends out a dense and even spray. The plot was sprayed between 1 and 4 p.m. on a warm, cloudy, still day, the ground beneath the trees being covered with a good growth of grass. No special care was taken, and as the wash was mixed on the plot several concentrated patches resulted where the "Mistifier" was filled from the mixing receptacle. While the washing was in progress twenty Kent ewes were turned on the land and at once commenced eating the wet grass.

The sheep were examined from day to day. On May 24th

all the animals were quite normal, feeding and chewing the cud. On the following day the ewes were again visited, when some of them appeared rather sluggish and a few were scouring. On the 26th the only further alteration in their condition was that a few more appeared to scour. Several sheep, however, in the same orchard, on grass which had not been sprayed, showed similar symptoms. On all subsequent dates, when visited, the sheep presented quite a normal and healthy appearance. The last examination took place on June 7th, and the sheep were found to be in excellent condition. They were then removed from the treated plot.

The result of this experiment corroborates the observations of practical men and also the results and conclusions derived from similar trials conducted years ago in America, namely, that stock may be kept on land where trees are washed with arsenites.

CUCUMBER AND MELON LEAF BLOTCH.

Cercospora Melonis, Cke.

This fungus, although first observed and described as a new species so recently as 1896, has spread with remarkable rapidity, and at the present moment is the most destructive parasite with which the cultivator of cucumbers and melons has to contend. In several instances growers report an annual loss of £1,000, whereas others have had to abandon the cultivation of these plants owing to the repeated destruction of their entire stock, in places where the fungus has secured a firm foothold.

The foliage is the part attacked. The first indication of the presence of the disease is the appearance of a few small, scattered, pale green spots on the upper surface of the leaf. The spots gradually increase in size and also in number, and often run together, gradually passing through grey to a brownish or ochreous colour. If at this stage the upper surface of a diseased spot be examined with a pocket-lens, it will be seen to be covered with delicate upright brown threads, each bearing a conidium at its tip. This represents the fruiting portion of the fungus, the mycelium or hyphae being buried in the substance of the leaf.

The minute conidia or reproductive bodies are carried from diseased to healthy leaves by currents of air, insects, clothing, &c., or by spraying, and if the leaf surface is moist such conidia germinate and the germ-tubes enter the tissues of the leaf directly.

Very frequently a leaf becomes quite dry and crumbles to the ground within twenty-four hours of the first infection. Such dead fallen leaves are much more responsible for the rapid spread of the epidemic than are the conidia which pass directly from one leaf to another.

When the dry fragments of a diseased leaf fall on damp earth, the mycelium present in the tissues quickly commences growth

and forms an exceedingly delicate cobweb-like mycelium which runs on the surface of the soil and produces myriads of very minute conidia which are dispersed by currents of air, and infect the leaves in a manner similar to that of the larger conidia borne on the leaves.

The mycelium in the soil originating from diseased fallen leaves continues to extend and produce conidia so long as the requisite conditions as to moisture and temperature are present. When these conditions fail, the mycelium passes into a resting condition, but readily assumes renewed activity when stimulated by returning moisture and heat. By this means the fungus survives from one season to another in the soil, and the disease is almost certain to recur year after year in a house that is once infected, unless the soil is thoroughly sterilised.

It is important to remember that the disease under consideration can only assume the proportions of a destructive epidemic when attacking plants grown under glass, and where a high temperature and an excess of moisture are present. Such conditions, accompanied by a deficiency of light, result in the production of "soft" foliage, and it is only such soft foliage that the fungus can attack. Experiments carried out at Kew prove that the fungus cannot inoculate leaves that have developed under "lights," or in the open air. Plants that are badly diseased, if removed to the open air produce new foliage, which remains perfectly healthy.

The disease is entirely an artificial creation, rendered possible by the rushing mode of cultivation followed.

The seed remains perfectly free from disease, hence there is no fear of its introduction from this source, and its sudden appearance in a new locality remained inexplicable until indicated by the following incident:—An establishment in Hertfordshire sending consignments of cucumbers to Covent Garden market, remained free from the disease until the commencement of the present season, when on one occasion some empty "flats" or packing boxes that had contained cucumbers, sent from a place where the disease was known to be rampant, were by mistake returned from Covent Garden to the Herts establishment, where from that date the disease appeared and is now practically beyond control.

To test the possibility of this means of introducing the disease, an empty box that had contained diseased cucumber leaves sent to Kew for determination, was placed over a young vegetable marrow plant that was growing under glass; within three days every leaf was destroyed by the disease. Another marrow plant growing in the open and subjected to similar treatment did not contract the disease.

Preventive Measures.

If the foliage is fairly hard the disease cannot assume the dimensions of an epidemic, and even if it appears it can be kept well in hand by spraying. To accomplish this end a fair supply of air should be admitted so that the atmosphere is not constantly saturated with moisture. It is wise to spray in anticipation of the disease, using a solution of potassium sulphide—two ounces to three gallons of water, adding two ounces of soft soap.

It is very important that the under surface of the leaves be thoroughly wetted with the solution.

If the disease is present, the soil should also be drenched with the solution.

Diseased leaves should be removed and burned before they decay and fall to the ground.

After a diseased crop has been removed the soil should be thoroughly drenched with a solution of "Jeyes' Fluid," in the proportion of an ounce to a gallon of rain water.

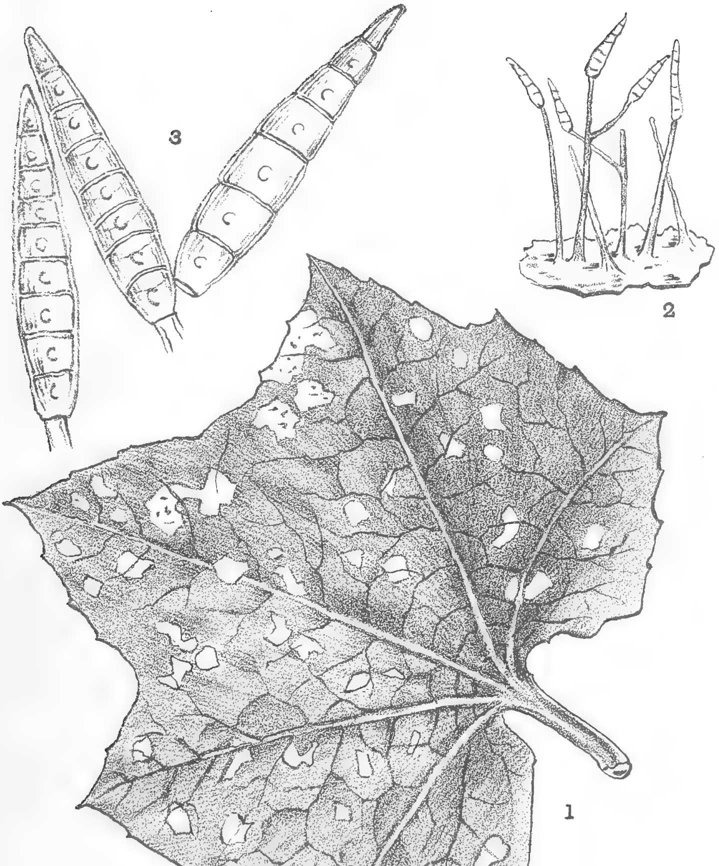
As to the danger of infection arising from spores being conveyed in packing cases as recorded above, no suggestions can be offered; nevertheless the matter is one claiming the attention of cultivators, and as the wholesale mixing up of such hampers appears to be the rule rather than the exception, it is probable that many diseases other than the one under consideration have by this means been first introduced to a new locality.*

Description of the Figures.

1. *Cucumber leaf shewing the disease in an early stage of development. Natural size.*
2. *Portion of a diseased patch of leaf shewing the fruiting condition of the fungus. Magn.* 40.
3. *Ripe Conidia. Magn.* 400.

* Copies of this article in leaflet form may be obtained free of charge and post free on application to the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

PLATE IV.



CUCUMBER AND MELON LEAF-BLOTCH.

AGRICULTURAL IMPORTS OF THE CEREAL YEAR.

The quantities and values of the principal articles of agricultural produce imported into the United Kingdom during the cereal year 1901-02, and the corresponding figures for the preceding year, are indicated in the tabular statement on the next page.

The imports of cereals increased by over $3\frac{1}{2}$ million cwt. of wheat and nearly $4\frac{1}{2}$ million cwt. of barley, but there was a decrease in wheat meal and flour, oats, and maize to the extent of about $4\frac{1}{4}$, $5\frac{1}{2}$ and $8\frac{1}{2}$ million cwt. respectively.

Of the 75,000,000 cwt. of wheat imported, nearly 42,000,000 cwt. came from the United States as compared with 39,000,000 cwt. in the previous year. The next largest contribution was sent from the British East Indies, the imports from that country amounting to nearly $7\frac{1}{2}$ million cwt., or five times more than in 1900-01. The shipments of this cereal received from Australasia showed an increase of more than 1 million cwt., but the supplies from Argentina fell from 11,000,000 cwt. in 1900-01 to 5,000,000 cwt. last year. The United States was also the chief contributor to our imports of wheat meal and wheat flour. The quantity imported from the States last year was 15,000,000 tons, or more than three-fourths of the total amount received, but this figure is 5,000,000 cwt. short of the quantity shipped to this country from the States in the previous year. The amount of wheat meal and flour imported from Austria-Hungary also decreased, but larger consignments were received from both Canada and France. The increase in barley is largely due to the greater quantities sent from Russia and Roumania, and the deficiency

in the case of oats is attributable to a great falling off in the supplies from Russia, the United States and Canada.

ARTICLES.	1ST SEPT., 1901, to 31ST AUG., 1902.		1ST SEPT., 1900, TO 31ST AUG., 1901.	
	Quantities.	Values.	Quantities.	Values.
		£		£
Horses ... ... No.	34,177	919,354	43,627	1,149,119
Cattle ... ... ,,	436,499	8,025,679	497,734	8,918,315
Sheep and Lambs ,,	326,015	498,674	332,443	514,284
Bacon ... ... cwts.	5,435,093	13,662,784	5,627,589	12,851,285
Hams ... ... ,,	1,622,559	4,098 338	1,828,424	4,373,512
Beef:				
Salted... ... ,,	176,644	257,681	203 898	263,901
Fresh ... ... ,,	4,068,525	8,361,784	4,400,699	8,734,035
Meat unenumerated:				
Salted or fresh ,,	646,681	1,164,412	571,316	1,070,380
Preserved otherwise than by salting ... ,,	901,938	2,720,915	788,043	2,333,382
Mutton, fresh ... ,,	3,723,340	6,833,924	3,464,763	6,340,909
Pork:				
Salted (not Hams) ,,	230,728	332,281	243,157	307,713
Fresh ... ... ,,	730,664	1,594,788	757,714	1,640,276
Rabbits ... ... ,,	406,078	670,943	442,832	705,156
Corn:				
Wheat... ... ,,	74,701,839	24,826,581	71,180,630	24,209 144
Wheat Meal and Flour ... ,,	19,115,628	8,730,420	23,349,814	10,914,305
Barley... ... ,,	23,058,390	6,484,041	18,745,910	5,517,183
Oats ... ... ,,	16,703,449	5,383,612	22,102,770	5,998,633
Maize ... ... ,,	47,202,169	12,370,843	55,805,800	13,055,182
Butter ... ,,	3,854,971	20,049,244	3,631,949	18,875,109
Margarine ... ,,	1,030,495	2,612,592	943,514	2,504,070
Cheese ... ... ,,	2,626 270	4,391,408	2,523,670	6,233,236
Milk, condensed ,,	896,222	1,785,587	955,062	1,765,342
,, and cream, fresh and preserved... ,,	21,751	37,464	23,360	37,725
Eggs ... gt. hundreds	18,583,297	6,145,233	16,779,107	5,370,002
Fruit:				
Apples ... cwts.	1,650,841	1,154,640	2,323 110	1,356,502
Pears ... ... ,,	307,722	259,946	442,313	346,872
Hops ... ... ,,	117,749	444,913	188,873	785,039
Onions ... bushels	7,287,670	970,561	7,332,162	844,896
Potatoes ... ... cwts.	5,082,992	1,472,491	9,882,847	2,346,583
Tomatoes ... ,,	763,019	677 994	864,106	795,160
Tallow and Stearine ,,	1,870,308	2,750,925	1,826,785	2,322,673
Wool ... ... lbs.	665,126,317	21,392 839	677,028,507	21,612,304
Hides, wet and dry ... ... cwts.	1,004,496	2,540,379	850,730	2,003 292
Lard ... ,,	1,713,343	4,070,306	2,066,511	3,982,524
Poultry and Game	—	1 050 357	—	967,789
Vegetables (unenumerated) ...	—	452,434	—	537,258

There was a general decrease in the number of imported animals, viz., over 9,000 horses, 61,000 cattle, and 6,000 sheep. There was also a decrease in the supply of the

following animal products:—Fresh beef, 332,000 cwt.; salt beef, 27,000 cwt.; bacon, 192,000 cwt.; hams, 206,000 cwt.; salt pork, 12,000 cwt.; fresh pork, 27,000 cwt.; lard, 353,000 cwt.; and wool, nearly 12,000,000 lb. The imports of salted or fresh meat unenumerated, preserved meat unenumerated, and fresh mutton were greater by 75,000, 114,000, and 259,000 cwt. respectively.

The decrease in the numbers of horses imported is accounted for by the fact that the numbers received from the United States, whence the bulk of our imports of these animals is derived, show a decline of 58 per cent. as compared with 1900-01. Decreases in the shipments from the States and Canada to this country are the cause of the diminished total imports of live cattle in the past year; while the smaller number of sheep and lambs is chiefly to be ascribed to the reduced shipments from the United States. The decreased imports of fresh and salt beef are also due to the diminished supplies received from that country, which sends the greater portion of our imports of both these articles. The United States, moreover, supplied 67 per cent. of the bacon and 90 per cent. of the hams imported. Fresh mutton, however, came chiefly from New Zealand and Argentina, which together supplied three-fourths of the total imports, the remainder being imported chiefly from Holland and Australia.

Dairy produce also increased: butter by 223,000 cwt., cheese by 103,000 cwt., and margarine by 87,000 cwt.; but condensed milk showed a decrease of 59,000 cwt. and fresh and preserved milk and cream decreased by 1,600 cwt. Eggs showed an increase of 1,800,000 great hundreds, and poultry and game of £82,000 in value. There was a considerable decline in the imports of fruit and vegetables, and in the case of potatoes the decrease amounted to no less than 4,800,000 cwt.

Our chief supplies of butter were obtained from Denmark, Russia, Holland and France, all of which sent increased quantities this year. Russia contributed 4,600,000, Germany 4,000,000, and Denmark 3,300,000 great hundreds to the total number of eggs imported.

AGRICULTURAL RETURNS OF 1902.

The preliminary statement giving the totals of the acreage under crops and grass and the number of live stock in Great Britain, as returned by the occupiers of land on June 4th last, was issued by the Board of Agriculture on August 27th. The distribution of the acreage under each crop in the present and immediately preceding year are contrasted in the following Table, and the details for each county will be found in the Tables at the end of this note :—

Crops in Great Britain.		1902.	1901.	Increase.	Decrease.
Total Acreage under all Crops and Grass. (*a*)		Acres. 32,387,965	Acres. 32,417,445	Acres. ...	Acres. 29,480
Wheat		1,726,473	1,700,965	25,508	...
Barley		1,909,383	1,972,448	...	63,065
Oats		3,057,203	2,996,902	60,301	...
Rye		68,379	56,650	11,729	...
Beans		243,101	251,613	...	8,512
Peas		179,751	155,130	24,621	...
Potatoes		573,880	577,260	...	3,380
Turnips and Swedes		1,608,661	1,664,525	...	55,864
Mangold		441,414	398,805	42,609	...
Cabbage		69,039	60,341	8,698	...
Kohl-Rabi		23,937	17,004	6,933	...
Rape		100,356	102,980	...	2,624
Vetches or Tares...		172,147	157,546	14,601	...
Lucerne		53,663	43,546	10,117	...
Other Crops		104,788	107,223	...	2,435
Clover and Rotation Grasses.	For Hay ...	2,364,302	2,356,415	7,887	...
	Not for Hay	2,467,596	2,499,972	...	32.376
Total		4,831,898	4,856,387	...	24,489
Permanent Grass (*a*)	For Hay ...	4,580,719	4,350,459	230,260	...
	Not for Hay	12,225 795	12,476,790	...	250,995
Total		16,806,514	16,827,249	...	20,735
Flax		838	640	198	...
Hops		48,031	51,127	...	3,096
Small Fruit		75,378	74,999	379	...
Bare Fallow		293,131	344,105	...	50,974

(*a*) Not including Mountain and Heath Land.

The total area accounted for has, it will be seen, again slightly diminished during the year. Wheat, however, which in 1901 showed a decrease of 144,000 acres, has on this occasion recovered 25,500 acres—an increase of 1½ per cent. on the surface devoted to this cereal. The small area under rye and that shown as under peas exhibit relatively large extensions, and the oat crop shows a rise of 2 per cent. Barley, on the other hand, has diminished by rather more than 3 per cent., and a reduction by a similar percentage occurs in beans. The area under all six corn crops is, however, greater on the year by nearly 50,600 acres. The area under turnips is once again diminished, the loss being 55,900 acres, or 3·4 per cent., for which, however, some compensation appears among other green crops. An increase in mangolds of 42,600 acres makes the area under this crop greater than in any previously recorded year, while the cultivation of the minor crops of cabbage and kohl-rabi has extended. Lucerne continues to increase in favour, and the additional 10,100 acres recorded this year is equivalent to an augmentation of 23 per cent. Neither in clover and rotation grasses nor in permanent grass is any significant change exhibited, and though the aggregate area returned is in both cases less than last year, the quantity cut for hay in 1902 appears to have been greater than in any year since 1895. The arable land left uncropped, which has shown a tendency to decline for some years past, now stands at a lower figure than in any previous year.

Turning to the statistics of live stock, which are recorded in the following Table, it will be seen that the horses employed in agriculture were fewer by 1 per cent., although a slight increase appears in the unbroken horses returned. Both cattle and sheep in Great Britain declined, but there was a recovery from the small total of last year in the number of pigs recorded.

It may be noted that fewer cattle of all ages were returned in 1902 than in any year since 1897. The total decrease in the past year amounted to nearly 208,000 head, or 3·1 per cent., the heaviest relative reduction—6·7 per cent.—occurring in the group of cattle of two years old and above, which were most readily marketable. Sheep also continue to diminish, the aggregate showing this year a loss of 611,500, or 2·3 per

cent., bringing the flocks of Great Britain somewhat below the total of 1895.

Animals in Great Britain.	1902.	1901.	Increase.	Decrease.
	No.	No.	No.	No.
Horses used solely for Agriculture (*a*)	1,076,170	1,089,418	...	13,248
Unbroken Horses :—One year and above ...	298,606	294,162	4,444	...
,, ,, Under one year ...	130,013	127,851	2,162	...
TOTAL OF HORSES	1,504,789	1,511,431	...	6,642
Cows and Heifers in Milk or in Calf	2,556,126	2,602,294	...	46,168
Other Cattle :—Two years and above ...	1,332,362	1,427,983	...	95,621
,, ,, One year and under two ...	1,385,776	1,407,653	...	21,877
,, ,, Under one year	1,281,712	1,325,964	...	44,252
TOTAL OF CATTLE	6,555,976	6,763,894	...	207,918
Ewes kept for Breeding	9,999,171	10,161,830	...	162,659
Other Sheep :—One year & above	5,523,710	5,940,896	...	417,186
,, ,, Under one year	10,242,825	10,274,474	...	31,649
TOTAL OF SHEEP	25,765,706	26,377,200	...	611,494
Sows kept for Breeding	349,000	319,724	29,276	...
Other Pigs	1,950,567	1,860,201	90,366	...
TOTAL OF PIGS	2,299,567	2,179,925	119,642	...

(*a*) Including Mares kept for Breeding.

The Department of Agriculture and Technical Instruction for Ireland have also issued preliminary statements of the agricultural returns for that country. The areas under the various Irish crops in 1902 are compared in the subjoined Table with those for 1901. Small increases may be noticed in wheat and barley and a decrease in oats. The changes are unimportant in respect of other crops with the exception of flax, which increased in 1901 by about 8,000 acres, but again

exhibits a decline of 5,700 acres, or about 10 per cent. The area devoted to grazing is returned as extended by nearly 58,000 acres, but, on the other hand, there was a decrease of nearly 36,000 acres in the cropped area. On balance, therefore, the total area accounted for as under crops and grass in Ireland in 1902 was greater by about 12,000 acres than in 1901 :—

Crops in Ireland.	1902.	1901.	Increase.	Decrease.
	Acres.	Acres.	Acres.	Acres.
Total Area under Crops	4,595,416	4,631.051	...	35,635
Wheat	44,471	42,934	1,537	...
Oats	1,081,751	1,099,335	...	17,584
Barley	167,790	161,534	6,256	...
Bere and Rye	9,723	11,151	...	1,428
Beans and Peas	2,663	2,620	43	...
Potatoes	629,481	635,321	...	5,840
Turnips	288,421	289,759	...	1,338
Mangold and Beetroot	77,106	77,457	...	351
Cabbage	42,300	43,520	...	1,220
Vetches and Rape	6,864	7,812	...	948
Carrots, Parsnips, and other Green Crops	26,277	25,574	703	...
Flax	49,746	55,442	...	5,696
Hay :—From Clover, Sainfoin, and Rotation Grasses .	603,375	617,330	...	13,955
,, From Grass not broken up in Rotation	1,565,448	1.561,262	4,186	...
Grass	10,635,190	10,577,238	57,952	...

Bringing together, so far as these Irish Tables permit, the areas under certain crops in the United Kingdom (excluding the Channel Islands and the Isle of Man, for which the data are not yet available), the net changes in the distribution may be shown as follows :—

Crops in Great Britain and Ireland.	1902.	1901.	Increase.	Decrease.
	Acres.	Acres.	Acres.	Acres.
Wheat	1,770,944	1,743,899	27,045	...
Oats	4,138,954	4,096,237	42,717	...
Barley	2,077,173	2,133,982	...	56.809
Beans and Peas	425,515	409,363	16,152	...
Potatoes	1.203,361	1,212,581	...	9,220
Turnips	1,897,082	1,954,284	...	57,202
Mangold	518,424	476,088	42,336	...

In opposition to what has been the case in Great Britain, the Irish stock, both of horses and cattle, is shown in the following Table to have increased, the former by 3·6 per cent. and the latter by 2·3 per cent., while pigs also showed a substantial rise, amounting to 9 per cent. Sheep, on the other hand, diminished by 3.7 per cent. :—

Animals in Ireland.	1902.	1901.	Increase.	Decrease.
	No.	No.	No.	No.
Horses used solely for Agriculture	358,314	354,750	3,564	...
Unbroken Horses :—				
One year and above	81,897	73,691	8,206	...
Under one year	69,073	62,989	6,084	...
Total of Horses	509,284	491,430	17,854	...
Milch cows, including heifers in calf	1,510,701	1,482,483	28,218	...
Other Cattle :—				
Two years and upwards ...	1,077,615	1,041,506	36,109	...
One year and under two ...	1,067,725	1,046,203	21,522	...
Under one year	1,126,163	1,103,131	23,032	...
Total of Cattle	4,782,204	4,673,323	108,881	...
Ewes, kept for breeding	1,653,290	1,691,506	...	38,216
Other sheep :—				
One year and upwards ...	845,834	894,945	...	49,111
Under one year	1,716,616	1,792,299	...	75,683
Total of Sheep	4,215,740	4,378,750	...	163,010
Sows kept for breeding	141,625	130,580	11,045	...
Other pigs	1,185,967	1,088,555	97,412	...
Total of Pigs	1,327,592	1,219,135	108,457	...

By adding the numbers of cattle, sheep and pigs in Ireland to those above given for Great Britain, as in the following Table, it will be seen that for the United Kingdom, as a whole (excluding the Isle of Man and the Channel Islands), the total

net diminution in 1902 is, in the case of cattle, less than 1 per cent., while in that of sheep it is about 2½ per cent. :—

Animals in Great Britain and Ireland.	1902.	1901.	Increase.	Decrease.
	No.	No.	No.	No.
Horses used solely for Agriculture	1,434,484	1,444,168	...	9,684
Unbroken Horses :—				
One year and above	380,503	367,853	12,650	...
Under one year	199,086	190,840	8,246	...
Total of Horses	2,014,073	2,002,861	11,212	...
Milch cows, including heifers in calf	4,066,827	4,084,777	...	17,950
Other Cattle :—				
Two years and upwards ...	2,409,977	2,469,489	...	59,512
One year and under two ...	2,453,501	2,453,856	...	355
Under one year	2,407,875	2,429,095	...	21,220
Total of Cattle	11,338,180	11,437,217	...	99,037
Ewes kept for breeding	11,652,461	11,853,336	...	200,875
Other Sheep :—				
One year and upwards ...	6,369,544	6,835,841	...	466,297
Under one year	11,959,441	12,066,773	...	107,332
Total of Sheep	29,981,446	30,755,950	...	774,504
Sows kept for breeding	490,625	450,304	40,321	...
Other Pigs	3,136,534	2,948,756	187,778	...
Total of Pigs	3,627,159	3,399,060	228,099	...

The local areas under wheat, barley, oats, potatoes, hops, clover and rotation grasses, and permanent grass, together with the number of cattle, sheep and pigs in each county in Great Britain, are shown in detail in the following Tables :—

PRELIMINARY STATEMENT of the ACREAGE under WHEAT, BRITAIN, compiled from the Returns collected on the

COUNTIES.	Wheat.		Barley.		Oats.	
	1902.	1901.	1902.	1901.	1902.	1901.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
TOTAL FOR GREAT BRITAIN	1,726,473	1,700,965	1,909,383	1,972,448	3,057,203	2,996,902
ENGLAND ...	1,630,892	1,617,721	1,578,977	1,635,426	1,892,717	1,831,740
WALES	48,323	47,019	101,326	101,907	210,153	208,773
SCOTLAND ...	47,258	36,225	229,080	235,115	954,333	956,389
ENGLAND.						
BEDFORD	37,119	35,227	17,968	18,529	20,114	17,905
BERKS	34,286	35,235	24,970	27,422	34,893	31,788
BUCKINGHAM ...	32,685	31,862	16,170	18,191	29,505	28,044
CAMBRIDGE	89,803	93,514	55,634	53,896	49,340	46,389
CHESTER	13,614	12,223	1,567	2,106	62,213	62,556
CORNWALL	24,101	24,217	31,932	32,347	67,657	64,150
CUMBERLAND ...	2,327	1,869	1,844	1,954	72,055	71,830
DERBY	14,418	12,890	5,708	6,062	23,364	23,961
DEVON	49,845	50,520	40,971	44,022	128,805	122,627
DORSET	18,736	20,615	28,743	29,521	29,627	27,740
DURHAM	13,545	8,794	16,983	18,486	32,234	34,590
ESSEX	109,227	110,826	83,432	82,679	66,448	59,894
GLOUCESTER	41,443	43,301	27,291	28,919	33,387	31,655
HANTS	51,784	55,078	36,471	40,706	80,414	73,836
HEREFORD	22,249	22,568	19,003	19,828	25,131	23,638
HERTFORD	49,501	47,542	26,440	27,749	37,422	34,631
HUNTINGDON ...	32,195	31,563	20,458	20,445	12,039	12,287
KENT	43,297	42,376	34,516	36,165	45,183	44,497
LANCASTER	21,636	17,329	8,161	7,877	66,386	72,202
LEICESTER	22,612	21,708	11,796	12,842	24,193	24,635
LINCOLN	167,843	173,098	202,462	207,940	125,321	119,347
LONDON	97	87	18	35	87	141
MIDDLESEX	2,761	3,008	751	835	2,461	2,534
MONMOUTH	5,215	5,566	4,153	4,538	8,482	8,558
NORFOLK	112,719	118,323	198,091	200,014	75,526	67,273
NORTHAMPTON ...	44,793	44,399	41,416	42,164	25,149	25,706
NORTHUMBERLAND ...	6,876	4,061	32,846	34,848	43,496	45,271
NOTTS	37,378	36,626	34,642	36,735	36,510	35,472
OXFORD	33,751	34,540	39,586	41,886	32,466	30,387
RUTLAND	5,105	4,991	9,777	9,579	4,044	3,632
SALOP...	29,101	27,934	48,391	52,832	44,293	41,049
SOMERSET	28,353	29,894	26,747	28,408	27,444	25,467
STAFFORD	20,141	17,775	14,426	17,243	37,077	37,574
SUFFOLK	96,125	99,601	138,116	134,971	49,323	44,002
SURREY	18,350	18,125	7,373	8,429	23,251	21,943
SUSSEX	49,477	49,939	10,489	12,099	61,570	58,378
WARWICK	33,208	32,140	12,706	14,097	29,733	29,536
WESTMORLAND ...	169	130	819	775	14,577	14,508
WILTS	47,459	50,177	34,743	39,606	48,400	45,434
WORCESTER	29,038	27,009	8,510	9,593	20,213	19,955
YORK, E. RIDING ...	63,172	60,204	73,695	73,202	94,122	95,727
,, N. RIDING ...	26,722	18,745	74,143	78,368	73,034	75,117
,, W. RIDING ...	48,616	42,092	55,019	57,483	75,728	75,874

BARLEY and OATS in the several COUNTIES of GREAT
4th June, 1902, with a COMPARATIVE STATEMENT for 1901.

COUNTIES (*Continued*).	Wheat.		Barley.		Oats.	
	1902.	1901.	1902.	1901.	1902.	1901.
WALES.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
ANGLESEY	326	374	1,605	1,534	20,362	19,268
BRECON	3,317	3,255	4,223	4,416	12,256	12,236
CARDIGAN	5,979	5,751	15,134	15,433	26,729	26,278
CARMARTHEN ...	8,066	8,001	14,284	13,991	27,005	27,310
CARNARVON	367	535	5,393	5,394	10,763	10,578
DENBIGH	5,854	5,619	13,918	13,738	24,727	24,426
FLINT	3,953	3,618	5,394	5,790	10,548	10,915
GLAMORGAN	4,303	4,635	7,112	7,431	10,919	10,835
MERIONETH	704	803	4,091	4,047	8,841	8,683
MONTGOMERY ...	9,605	8,867	7,798	8,217	20,943	20,514
PEMBROKE	2,970	2,878	18,919	18,443	25,494	26,031
RADNOR	2,879	2,683	3,455	3,473	11,566	11,699
SCOTLAND.						
ABERDEEN	2	10	28,831	27,628	184,667	185,565
ARGYLL	1	1	1,504	1,510	17,316	17,239
AYR	828	873	1,204	1,651	44,046	43,198
BANFF	14	11	10,241	9,814	47,561	47,945
BERWICK	2,220	1,081	19,768	20,885	33,337	33,815
BUTE	...	5	52	90	4,899	4,929
CAITHNESS	...	7	1,149	1,151	33,319	33,610
CLACKMANNAN ...	258	182	564	492	3,025	2,938
DUMBARTON	871	806	269	282	6,729	6,666
DUMFRIES	115	105	622	754	41,407	41,512
EDINBURGH	4,470	3,536	5,818	5,786	22,683	23,009
ELGIN or MORAY ...	748	706	13,205	13,835	21,649	21,428
FIFE	9,994	7,466	21,731	23,132	38,852	38,872
FORFAR	8,227	7,086	29,958	30,474	48,008	48,890
HADDINGTON ...	4,800	4,041	16,296	16,135	17,082	17,670
INVERNESS	67	38	7,130	7,195	30,346	30,262
KINCARDINE	566	393	13,379	13,381	27,269	27,675
KINROSS	17	18	489	493	6,283	6,327
KIRCUDBRIGHT ...	55	81	44	35	27,107	26,627
LANARK	2,323	1,491	244	324	36,538	36,260
LINLITHGOW	1,341	879	3,164	3,434	9,869	9,804
NAIRN	...	...	3,432	3,403	5,457	5,473
ORKNEY	...	...	4,536	4,527	33,651	33,554
PEEBLES	13	6	336	417	7,936	7,827
PERTH	5,416	3,570	13,883	15,573	65,388	65,427
RENFREW	1,503	1,304	106	80	10,676	10,509
ROSS and CROMARTY	756	601	12,416	12,597	30,382	30,171
ROXBURGH	539	289	12,240	12,883	28,392	28,414
SELKIRK	9	...	306	334	4,756	4,821
SHETLAND	...	...	1,571	1,711	7,598	7,546
STIRLING	1,854	1,347	2,788	3,127	17,387	17,808
SUTHERLAND ...	...	...	1,166	1,264	8,040	7,887
WIGTOWN	251	292	638	718	32,678	32,711

PRELIMINARY STATEMENT of the ACREAGE under CLOVER and
compiled from the Returns collected on the

COUNTIES.	Clover and Rotation Grasses.					
	FOR HAY.		NOT FOR HAY.		TOTAL.	
	1902.	1901.	1902.	1901.	1902.	1901.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
TOTAL FOR GREAT BRITAIN	2,364,302	2,356,415	2,467,596	2,499,972	4,831,898	4,856,387
ENGLAND	1,737,608	1,730,155	1,087,307	1,132,503	2,824,915	2,862,658
WALES	208,798	201,943	196,792	198,325	405,590	400,268
SCOTLAND... ...	417,896	424,317	1,183,497	1,169,144	1,601,393	1,593,461
ENGLAND.						
BEDFORD	17,470	20,941	6,144	7,031	23,614	27,972
BERKS	35,810	34,552	7,870	8,049	43,680	42,601
BUCKINGHAM ...	27,209	28,342	6,121	7,001	33,330	35,343
CAMBRIDGE	39,813	41,168	18,932	19,701	58,745	60,869
CHESTER	63,113	59,871	15,664	14,111	78,777	73,982
CORNWALL	52,610	51,023	134,426	137,003	187,036	188,026
CUMBERLAND ...	43,459	42,700	71,803	73,048	115,262	115,748
DERBY	19,279	18,701	7,089	5,995	26,368	24,696
DEVON	78,703	76,521	136,686	140,515	215,389	217,036
DORSET	33,107	31,432	16,588	17,639	49,695	49,071
DURHAM	40,065	39,967	11,405	12,414	51,470	52,381
ESSEX	64,971	67,969	30,459	34,766	95,430	102,735
GLOUCESTER	60,352	57,935	36,597	36,661	96,949	94,596
HANTS	89,773	87,017	29,661	28,758	119,434	115,775
HEREFORD	25,254	25,124	14,889	15,402	40,143	40,526
HERTFORD	38,139	38,776	8,093	9,517	46,232	48,293
HUNTINGDON ...	12,465	14,289	5,420	6,459	17,885	20,748
KENT	38,018	38,374	11,452	11,671	49,470	50,045
LANCASTER	73,549	71,745	10,444	11,395	83,993	83,140
LEICESTER	20,538	19,249	6,894	5,778	27,432	25,027
LINCOLN	95,709	95,226	98,818	100,324	194,527	195,550
LONDON	175	49	31	131	206	180
MIDDLESEX	1,837	1,694	687	524	2,524	2,218
MONMOUTH	12,313	11,342	5,656	5,285	17,969	16,627
NORFOLK	132,900	139,003	28,622	31,355	161,522	170,358
NORTHAMPTON ...	26,504	26,840	7,573	8,745	34,077	35,585
NORTHUMBERLAND	42,152	42,102	31,462	35,470	73,614	77,572
NOTTS	29,983	30,162	26,884	28,239	56,867	58,401
OXFORD	41,902	40,696	10,770	11,488	52,672	52,184
RUTLAND	3,212	3,609	2,220	2,749	5,432	6,358
SALOP	50,030	49,516	24,216	23,547	74,246	73,063
SOMERSET	31,660	29,875	21,782	22,866	53,442	52,741
STAFFORD	35,662	34,381	13,855	14,772	49,517	49,153
SUFFOLK	66,697	71,108	35,309	37,143	102,006	108,251
SURREY	18,935	18,164	4,828	5,551	23,763	23,715
SUSSEX	45,134	44,257	14,292	16,873	59,426	61,130
WARWICK	28,165	26,833	8,105	8,106	36,270	34,939
WESTMORLAND ...	6,973	7,068	8,415	9,009	15,388	16,077
WILTS	63,172	59,098	18,145	18,854	81,317	77,952
WORCESTER	19,566	19,181	9,830	10,153	29,396	29,334
YORK, E. RIDING ...	21,747	22,544	70,251	73,981	91,998	96,525
,, N. RIDING ...	41,255	41,031	32,424	34,732	73,679	75,763
,, W. RIDING ...	48,228	50,680	26,495	29,692	74,723	80,372

ROTATION GRASSES in the several COUNTIES of GREAT BRITAIN 4th June, 1902, with a COMPARATIVE STATEMENT for 1901.

COUNTIES (*Continued*).	Clover and Rotation Grasses.					
	FOR HAY.		NOT FOR HAY.		TOTAL.	
	1902.	1901.	1902.	1901.	1902.	1901.
WALES.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
ANGLESEY	23,061	22,638	26,432	24,559	49,493	47,197
BRECON	8,408	7,765	12,434	12,706	20,842	20,471
CARDIGAN	20,505	21,055	24,702	28,924	45,207	49,979
CARMARTHEN ...	19,710	19,887	16,460	16,695	36,170	36,582
CARNARVON	21,652	19,234	20,767	19,795	42,419	39,029
DENBIGH	27,201	26,319	28,055	27,195	55,256	53,514
FLINT	14,979	14,275	9,680	8,903	24,659	23,178
GLAMORGAN	16,881	16,347	7,937	9,368	24,818	25,715
MERIONETH	9,939	9,641	9,178	8,999	19,117	18,640
MONTGOMERY ...	18,181	17,235	12,973	13,847	31,154	31,082
PEMBROKE	19,871	19,691	19,378	19,321	39,249	39,012
RADNOR	8,410	7,856	8,796	8,013	17,206	15,869
SCOTLAND.						
ABERDEEN	48,248	50,433	235,700	233,065	283,948	283,498
ARGYLL	11,369	11,521	15,768	15,372	27,137	26,893
AYR	33,645	33,437	65,087	65,619	98,732	99,056
BANFF...	10,310	10,486	57,753	56,893	68,063	67,379
BERWICK	10,192	10,108	49,701	49,573	59,893	59,681
BUTE	2,143	2,278	5,849	5,887	7,992	8,165
CAITHNESS	9,503	9,784	25,092	23,582	34,595	33,366
CLACKMANNAN ...	1,887	1,817	1,382	1,383	3,269	3,200
DUMBARTON	7,107	7,335	10,955	10,790	18,062	18,125
DUMFRIES	18,635	17,953	66,065	63,833	84,700	81,786
EDINBURGH	13,545	13,611	20,943	20,283	34,488	33,894
ELGIN or MORAY ...	5,659	6,191	32,802	32,306	38,461	38,497
FIFE	28,030	28,105	38,674	38,432	66,704	66,537
FORFAR	20,793	21,033	67,605	66,186	88,398	87,219
HADDINGTON ...	10,649	11,311	17,285	17,720	27,934	29,031
INVERNESS	11,406	12,025	19,686	19,363	31,092	31,388
KINCARDINE	12,919	13,455	35,080	34,383	47,999	47,838
KINROSS	2,943	2,985	8,988	8,957	11,931	11,942
KIRKCUDBRIGHT ...	9,534	9,368	53,947	53,723	63,481	63,091
LANARK	35,212	35,357	51,088	51,645	86,300	87,002
LINLITHGOW	7,752	8,349	8,860	8,948	16,612	17,297
NAIRN...	1,888	2,060	8,316	8,249	10,204	10,309
ORKNEY	8,601	9,891	25,629	24,053	34,230	33,944
PEEBLES	2,457	2,447	16,779	13,984	19,236	16,431
PERTH	31,338	31,482	71,233	70,293	102,571	101,775
RENFREW	14,182	14,218	11,450	11,491	25,632	25,709
ROSS and CROMARTY	14,483	14,783	29,200	28,428	43,683	43,211
ROXBURGH	8,960	8,795	43,467	45,027	52,427	53,822
SELKIRK	1,152	909	7,936	7,856	9,088	8,765
SHETLAND	796	780	670	634	1,466	1,414
STIRLING	13,151	13,209	18,428	18,835	31,579	32,044
SUTHERLAND ...	4,184	3,932	5,086	4,872	9,270	8,804
WIGTOWN	5,223	4,869	56,993	57,479	62,216	62,348

PRELIMINARY STATEMENT of the ACREAGE under PERMANENT
from the Returns collected on the 4th June, 1902,

COUNTIES.	Permanent Grass.					
	FOR HAY.		NOT FOR HAY.		TOTAL.	
	1902.	1901.	1902.	1901.	1902.	1901.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
TOTAL FOR GREAT BRITAIN	4,580,719	4,350,459	12,225 795	12,476,790	16,806,514	16,827,249
ENGLAND	3,975,088	3,754,836	9,488,346	9,702,824	13,463,434	13,457,660
WALES	473,894	463,704	1,450,473	1,477,661	1,924,367	1,941,365
SCOTLAND... ...	131,737	131,919	1,286,976	1,296,305	1,418,713	1,428,224
ENGLAND.						
BEDFORD	31,041	27,865	73,102	76,194	104,143	104,059
BERKS...	74 440	72,059	95,216	99,129	169,656	171,188
BUCKINGHAM ...	93,775	87,472	151,765	156,468	245,540	243,940
CAMBRIDGE	36,670	36,391	78,323	79,970	114,993	116,361
CHESTER	92,464	91,232	241,809	248,065	334,273	339,297
CORNWALL	32,844	32,637	210,618	212,453	243,462	245,090
CUMBERLAND ...	74,701	72,308	273,404	275,433	348,105	347,741
DERBY	131,838	124,694	269,213	278,952	401,051	403,646
DEVON	115,499	109,284	529,489	535,664	644,988	644.948
DORSET	90,193	86,410	207,826	211,611	298,019	298,021
DURHAM	96,483	93,995	186,578	188,138	283,061	282,133
ESSEX	106,411	95,891	160,972	174,049	267,383	269,940
GLOUCESTER	152,380	140,872	248,415	259,144	400,795	400,016
HANTS	90,293	84,282	194,519	200,565	284,812	284,847
HEREFORD	81,043	77,786	220,436	221,704	301,479	299,490
HERTFORD	58,299	54,604	61,852	66,226	120,151	120,830
HUNTINGDON ...	24,678	21,256	61,097	64,388	85,775	85,644
KENT	112,901	102,222	303,076	314,111	415,977	416,333
LANCASTER	198,258	196,816	376,757	379,485	575,015	576,301
LEICESTER	97,037	87,622	262,607	272,188	359,644	359,810
LINCOLN	95,364	91,249	404,852	407,937	500,216	499,186
LONDON	2,994	3,532	4,907	4,828	7,901	8,360
MIDDLESEX	46,463	44,746	25,109	27,741	71,572	72,487
MONMOUTH	65,247	63,340	131,236	133,449	196,483	196,789
NORFOLK	50,199	44,048	239,660	244,467	289,859	288,515
NORTHAMPTON ...	90,025	81,782	269,258	275,069	359,283	356,851
NORTHUMBERLAND ...	77,395	72,696	423,120	421,951	500,515	494,647
NOTTS...	64,462	61,547	144,847	147,833	209,309	209,380
OXFORD	75.987	72,687	121,452	123,405	197,439	196,092
RUTLAND	12,103	11,399	40,455	40,908	52,558	52,307
SALOP	104,814	98,265	357,238	363,527	462,052	461,792
SOMERSET	242,099	220,902	416,923	437,176	659,022	658,078
STAFFORD	126,052	118,104	305,023	312,429	431,075	430,533
SUFFOLK	63,011	57,849	117,942	125,582	180,953	183,431
SURREY	76,705	71,005	78,981	84,963	155,686	155,968
SUSSEX	144,063	132,869	256,978	265,835	401,041	398,704
WARWICK	102,747	95,836	233,495	239,764	336 242	335,600
WESTMORLAND ...	55,477	53,871	153,650	154,650	209,127	208,521
WILTS...	147 219	139,251	280,759	287,473	427,978	426,724
WORCESTER	92,140	84,593	161,918	169,321	254,058	253,914
YORK, E. RIDING ...	41,222	39,460	172,664	171,919	213,886	211,379
,, N. RIDING ...	142,060	139,471	381,216	382,153	523,276	521,624
,, W. RIDING ...	265,992	260,636	559,589	566,507	825,581	827,143

GRASS in the several COUNTIES of GREAT BRITAIN, compiled with a COMPARATIVE STATEMENT for 1901.

COUNTIES (*Continued*).	Permanent Grass.					
	FOR HAY.		NOT FOR HAY.		TOTAL.	
	1902.	1901.	1902.	1901.	1902.	1901.
WALES.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
ANGLESEY	13,354	12,892	57,930	62,131	71,284	75,023
BRECON	37,049	36,332	118,708	119,073	155,757	155,405
CARDIGAN	36,411	35,202	121,976	124,670	158,387	159,872
CARMARTHEN ...	79,078	76,974	266,051	267,978	345,129	344,952
CARNARVON	36,967	38,581	76,254	79,359	113,221	117,940
DENBIGH	32,982	32,030	119,526	122,611	152,508	154,641
FLINT	18,276	18,086	54,593	56,752	72,869	74,838
GLAMORGAN	70,452	66,127	142,124	144,984	212,576	211,111
MERIONETH	35,331	35,349	80,652	81,720	115,983	117,069
MONTGOMERY ...	47,822	47,260	146,495	147,356	194,317	194,616
PEMBROKE	42,652	41,463	169,084	172,170	211,736	213,633
RADNOR	23,520	23,408	97,080	98,857	120,600	122,265
SCOTLAND.						
ABERDEEN	1,327	1,044	30,820	31,975	32,147	33,019
ARGYLL	14,958	15,012	65,574	65,194	80,532	80,206
AYR	16,215	16,761	142,224	141,873	158,439	158,634
BANFF	248	295	8,670	9,270	8,918	9,565
BERWICK	1,403	1,033	43,537	42,393	44,940	43,426
BUTE	693	592	9,494	9,208	10,187	9,800
CAITHNESS	1,146	1,408	25,442	27,570	26,588	28,978
CLACKMANNAN ...	477	634	5,832	5,787	6,309	6,421
DUMBARTON	1,472	1,459	19,516	19,765	20,988	21,224
DUMFRIES	18,183	18,282	92,415	94,466	110,598	112,748
EDINBURGH	1,575	1,810	42,810	43,902	44,385	45,712
ELGIN OF MORAY ...	262	176	8,948	8,766	9,210	8,942
FIFE	3,460	3,453	71,761	72,467	75,221	75,920
FORFAR	1,169	984	26,171	27,496	27,340	28,480
HADDINGTON ...	1,003	728	19,139	18,561	20,142	19,289
INVERNESS	4,977	4,712	57,309	57,322	62,286	62,034
KINCARDINE	199	154	9,563	9,463	9,762	9,617
KINROSS	903	741	12,203	12,194	13,106	12,935
KIRKCUDBRIGHT ...	12,632	13,209	73,983	73,524	86,615	86,733
LANARK	11,698	11,182	99,401	99,830	111,099	111,012
LINLITHGOW	854	864	20,364	20,014	21,218	20,878
NAIRN	86	21	1,915	1,945	2,001	1,966
ORKNEY	1,035	803	16,473	16,251	17,508	17,054
PEEBLES	1,107	1,442	16,326	18,340	17,433	19,782
PERTH	9,451	9,293	94,303	95,567	103,754	104,860
RENFREW	4,933	5,437	42,138	42,116	47,071	47,553
ROSS and CROMARTY	2,129	2,270	27,049	27,026	29,178	29,296
ROXBURGH	5,733	5,673	59,007	56,841	64,740	62,514
SELKIRK	1,439	1,230	11,549	11,974	12,988	13,204
SHETLAND	1,616	1,604	40,365	41,855	41,981	43,459
STIRLING	3,717	3,803	47,584	48,569	51,301	52,372
SUTHERLAND ...	1,284	1,259	8,287	8,562	9,571	9,821
WIGTOWN	4,353	4,551	36,804	36,219	41,157	40,770

PRELIMINARY STATEMENT of the NUMBER of CATTLE, SHEEP, from the Returns collected on the 4th June, 1902,

COUNTIES.	Cattle.		Sheep.		Pigs.	
	1902.	1901.	1902.	1901.	1902.	1901.
	No.	No.	No.	No.	No.	No.
TOTAL FOR GREAT BRITAIN	6,555,976	6,763,894	25,765,706	26,377,200	2,299,567	2,179,925
ENGLAND	4,611,937	4,791,535	15,034,479	15,548,057	1,956,158	1,842,133
WALES	721,874	743,078	3,462,698	3,427,734	215,283	212,971
SCOTLAND... ...	1,222,165	1,229,281	7,268,529	7,401,409	128,126	124,821
ENGLAND.						
BEDFORD	30,100	33,419	95,932	104,407	24,034	24,506
BERKS	42,092	43,608	162,692	170,619	20,571	19,218
BUCKINGHAM ...	68,977	73,390	185,256	191,700	26,706	26,355
CAMBRIDGE	52,619	55,147	191,038	202,307	42,912	41,819
CHESTER	174,670	179,218	93,044	102,402	67,148	66,999
CORNWALL	204,361	205,033	387,556	394,301	85,030	81,786
CUMBERLAND ...	149,929	150,384	575,183	609,665	18,280	17,461
DERBY	138,002	143,712	154,758	166,265	29,207	28,632
DEVON	278,049	278,297	803,889	815,694	95,267	89,239
DORSET	84,571	86,675	340,056	351,625	52,049	46,298
DURHAM	73,325	77,797	249,572	251,896	10,852	10,381
ESSEX	81,177	86,097	254,220	265,096	73,288	67,824
GLOUCESTER	121,410	123,441	367,055	360,169	67,835	61,509
HANTS	80,012	82,668	346,300	360,710	59,998	57,048
HEREFORD	90,178	92,522	328,404	331,875	24,755	22,533
HERTFORD	32,597	34,497	98,869	106,952	23,554	21,396
HUNTINGDON ...	26,786	28,794	83,226	85,393	16,397	15,478
KENT	66,356	73,047	823,487	856,430	61,794	55,564
LANCASTER	234,014	240,484	337,868	335,392	62,465	58,921
LEICESTER	134,476	139,195	299,575	306,424	22,864	21,696
LINCOLN	237,953	245,278	1,063,876	1,117,899	96,537	94,924
LONDON	5,001	5,290	4,346	4,038	2,287	2,134
MIDDLESEX	14,503	15,757	18,388	18,088	11,690	11,544
MONMOUTH	46,895	48,270	233,103	227,932	16,201	14,658
NORFOLK	122,432	143,543	517,018	552,142	87,312	85,565
NORTHAMPTON ...	117,962	121,190	378,318	386,400	26,665	24,466
NORTHUMBERLAND ...	113,872	114,521	1,057,725	1,067,379	9,394	9,692
NOTTS...	79,527	83,447	180,305	198,934	26,845	26,482
OXFORD	58,293	59,447	227,617	231,650	29,113	28,618
RUTLAND	17,411	18,205	78,828	80,834	2,106	2,026
SALOP	172,310	179,160	465,302	469,768	67,120	62,555
SOMERSET	228,512	237,618	491,089	500,569	118,407	104,810
STAFFORD	159,036	165,888	216,587	228,275	47,861	46,524
SUFFOLK	70,743	78,276	401,779	428,456	135,817	133,218
SURREY	38,283	41,349	62,228	67,452	19,673	18,853
SUSSEX	105,728	112,069	407,953	413,929	39,681	35,749
WARWICK	104,609	106,828	260,702	262,506	34,152	31,366
WESTMORLAND ...	68,562	70,226	374,016	372,248	4,599	3,960
WILTS...	110,357	113,275	474,038	486,023	55,430	51,290
WORCESTER	65,399	68,355	162,358	163,801	39,983	36,954
YORK, E. RIDING ...	82,915	86,683	411,021	467,364	54,560	51,847
,, N. RIDING ...	167,831	172,809	710,008	738,094	51,867	47,331
,, W. RIDING ...	260,102	276,626	659,894	694,954	93,852	82,904

and PIGS in the several COUNTIES of GREAT BRITAIN, compiled with a COMPARATIVE STATEMENT for 1901.

COUNTIES (*Continued*).	Cattle.		Sheep.		Pigs.	
	1902.	1901.	1902.	1901.	1902.	1901.
WALES.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
ANGLESEY	54,219	55,711	75,441	83,849	14,662	15,166
BRECON	40,040	41,379	498,612	488,195	7,711	7,571
CARDIGAN	68,061	70,428	270,494	272,404	21,131	20,776
CARMARTHEN ...	118,511	121,536	279,729	274,255	34,800	33,930
CARNARVON	53,653	56.120	268,852	266,589	18,803	18,366
DENBIGH	66,566	68,651	344,801	342,314	24,566	24,473
FLINT	35,815	37,053	84,343	84,348	16,387	17,110
GLAMORGAN	55,683	56,259	343,071	330,816	15,933	15,122
MERIONETH	36,385	38,354	433,278	430,356	7,338	7,718
MONTGOMERY ...	70,252	72,832	438,023	435,011	20,918	20,410
PEMBROKE	90,213	91,672	139,772	138.429	28,208	27,643
RADNOR	32,476	33,083	286,282	281,168	4,826	4,686
SCOTLAND.						
ABERDEEN	174,748	180,927	220,078	226,680	10,975	10,720
ARGYLL	62,106	60,645	903,973	926,143	4,217	4,050
AYR	102,451	101,369	382,036	381.885	13,151	13,324
BANFF...	44,238	44,861	64,248	64,247	2,860	2,765
BERWICK	16,866	16,905	317,254	325,324	3,267	3,365
BUTE	9,860	9,512	46,121	44,908	578	600
CAITHNESS	22,855	22,521	128,936	131,196	1,725	1,491
CLACKMANNAN ...	3,758	3,685	13,581	12.390	1,672	1,828
DUMBARTON	15,059	14,945	72,717	70,288	1,436	1,499
DUMFRIES	65,178	63,974	563,239	579,896	8,948	9,116
EDINBURGH	20,252	19,865	188,952	185,759	8,140	7,628
ELGIN, or MORAY ...	21,892	22,671	63,382	67,312	2,353	2,302
FIFE	49,739	51,352	113,032	115,029	4,797	4,746
FORFAR	51,609	55,772	160,668	161,806	7,230	6 380
HADDINGTON ...	9,740	9,890	125,324	127,047	1,427	1,415
INVERNESS	50,923	51,483	575,021	596,263	2,481	2 466
KINCARDINE	25,773	26,497	44,459	44,600	2,769	2,122
KINROSS	7,261	7,162	34,034	35,788	597	460
KIRKCUDBRIGHT ...	50,216	50,361	398,091	406,880	7,226	7,094
LANARK	74,976	75,121	243,935	242,306	6,222	6,180
LINLITHGOW ...	12,355	12,366	22,820	23,782	1,707	1,499
NAIRN...	5,851	6,247	18,234	21,284	738	686
ORKNEY	30,230	28,728	37,223	35,327	2,593	2,532
PEEBLES	7,215	7,304	199,383	202,018	623	589
PERTH	76,969	75,900	719,229	723,256	6,785	6,816
RENFREW	27,046	26,997	39,889	39,813	1,147	1.053
ROSS and CROMARTY .	44,134	44,367	282,755	310,745	4,513	3,919
ROXBURGH	18,605	17,859	534,922	539,486	2,714	2,664
SELKIRK	3,093	3,084	182,680	183,796	429	367
SHETLAND	18,784	19,050	116,096	115,311	1,713	2,240
STIRLING	33,853	34.269	124,956	124,178	2,234	2,200
SUTHERLAND ...	12,393	12,210	198,825	205,746	685	737
WIGTOWN	52,137	51,382	132,436	130,920	10,174	9,968

ACREAGE OF POTATOES.

COUNTIES.	1902.	1901.	COUNTIES. (*Continued.*)	1902.	1901.
TOTAL FOR GREAT BRITAIN	*Acres.* 573,880	*Acres.* 577,260	WALES.	*Acres.*	*Acres.*
			ANGLESEY	2,662	2,665
ENGLAND ...	412,739	415,105	BRECON	1,027	1,052
WALES	31,446	31,979	CARDIGAN	5,818	5,918
SCOTLAND ...	129,695	130,176	CARMARTHEN ...	3,603	3,694
			CARNARVON ...	4,128	4,187
ENGLAND.			DENBIGH	3,155	3,177
BEDFORD	9,571	9,829	FLINT	2,257	2,312
BERKS	1,844	1,830	GLAMORGAN ...	1,859	1,905
BUCKINGHAM ...	1,755	1,710	MERIONETH ...	1,793	1,776
CAMBRIDGE ...	26,441	25,501	MONTGOMERY ...	1,940	1,992
CHESTER	24,358	24,892	PEMBROKE	2,346	2,433
CORNWALL... ...	5,370	5,554	RADNOR	858	868
CUMBERLAND ...	7,876	8,436			
DERBY	2,402	2,563			
DEVON	12,690	12,911	SCOTLAND.		
DORSET	1,702	1,898			
DURHAM	9,819	9,854	ABERDEEN	7,446	7,477
ESSEX	9,975	9,966	ARGYLL	4,408	4,538
GLOUCESTER ...	3,783	4,074	AYR	8,898	8,193
HANTS	5,966	5,976	BANFF	2,004	2,033
HEREFORD	1,890	1,932	BERWICK	2,198	2,205
HERTFORD	5,023	5,233	BUTE	929	941
HUNTINGDON ...	9,377	9,025	CAITHNESS	1,669	1,675
KENT	14,172	13,632	CLACKMANNAN ...	347	403
LANCASTER ...	42,519	43,340	DUMBARTON ...	2,589	2,402
LEICESTER	2,066	2,146	DUMFRIES	3,389	3,452
LINCOLN	71,116	69,434	EDINBURGH ...	5,787	5,704
LONDON	326	369	ELGIN or MORAY ...	1,684	1,763
MIDDLESEX ...	2,477	2,645	FIFE..	14,552	15,252
MONMOUTH ...	1,319	1,403	FORFAR	12,222	12,146
NORFOLK	13,624	12,971	HADDINGTON ...	7,855	7,981
NORTHAMPTON ...	3,818	3,854	INVERNESS	5,936	5,977
NORTHUMBERLAND.	4,994	5,060	KINCARDINE ...	2,429	2,448
NOTTS	8,057	8,087	KINROSS	598	652
OXFORD	2,859	2,953	KIRKCUDBRIGHT ...	1,517	1,526
RUTLAND	195	214	LANARK	4,491	4,536
SALOP	6,018	6,614	LINLITHGOW ...	2,010	1,849
SOMERSET	4,828	5,130	NAIRN	342	354
STAFFORD	10,593	11,044	ORKNEY	2,750	2,760
SUFFOLK	3,128	2,877	PEEBLES	338	361
SURREY	5,412	5,770	PERTH	12,259	12,490
SUSSEX	4,003	3,695	RENFREW	3,083	3,022
WARWICK	6,681	6,929	ROSS and CROMARTY	7,291	7,374
WESTMORLAND ...	1,294	1,440	ROXBURGH ...	1,200	1,236
WILTS	2,864	3,023	SELKIRK	217	184
WORCESTER ...	6,829	6,988	SHETLAND	3,013	3,040
YORK, E. RIDING...	13,463	13,435	STIRLING	3,153	3,146
,, N. RIDING ...	12,699	13,157	SUTHERLAND ...	1,673	1,680
,, W. RIDING ...	27,543	27,711	WIGTOWN	1,418	1,376

ACREAGE OF HOPS.

	Acres.	*Acres.*		*Acres.*	*Acres.*
GLOUCESTER ...	46	46	SUFFOLK	4	4
HANTS	2,003	2,133	SURREY ...	969	1,232
HEREFORD	6,915	7,497	SUSSEX	4,541	4,800
KENT	29,649	31,242	WORCESTER ...	3,779	4,029
SALOP	125	144			
			TOTAL	48,031	51,127

AGRICULTURAL AND MISCELLANEOUS NOTES.

Sheep Gad-Fly, or Nostril Fly.

The Sheep Gad-fly, *Oestrus ovis*, is in appearance not unlike an overgrown house fly. It is very quick in its movements, and difficult to catch. When examined with the naked eye the upper part of the head and thorax appear brown, but when a magnifying glass is used the colour is found to be a dull yellow dotted over with little black elevated spots. The abdomen consists of five rings of a variegated dark brown and straw colour ; the feet are brown. The eyes are purplish brown and three small eyelets are distinctly visible on the top of the head. There is no mouth. The wings are transparent, and extend beyond the body, and the winglets, which are quite large and white, entirely cover them. The wings, however, are seldom used except when the fly is attempting to deposit its young. The males are not unlike the females, but are somewhat smaller, and do not disturb the sheep.

The fly works during the heat of the day, buzzing around the sheep, and trying to get a lodgment at the entrance to the nostrils in order to deposit its young. During this process the sheep are noticed to shake their heads and stamp the ground, at the same time keeping their noses close to the earth, and frequently running along in this peculiar position. At other times they stand huddled together in the shadow of a building or hedge with their heads in close contact to the ground or their neighbour's body.

If the fly, however, finds lodgment, it immediately deposits its young in the form of small larvæ or grubs. These larvæ are about one-twelfth of an inch in length, and when examined with a lens are seen to consist of a body divided into eleven segments two well-defined hooks, and two minute terminal breathing pores. Their ventral surfaces show numerous little spines which later on

become strong thorns. These minute larvæ attach themselves by means of their hooks to the mucous membrane of the nostril, and immediately begin to make their way upward into the nostrils, using their hooks and their ventral spines to aid their progress.

In the nostrils they remain until matured, when they average three-fourths of an inch in length by one-third in breadth. During their residence there they irritate and annoy the sheep, causing thickening of the nasal mucous membrane, and a catarrhal discharge from one or both nostrils, with sneezing and snuffling, and sometimes more serious symptoms which may end in emaciation, convulsions, and death. Having arrived at maturity, the larva escapes from the nostril, falls to the ground, and bores into it for an inch or two. It remains there for a few weeks, during which time (from four to eight weeks) the fly develops within the larval case, and eventually pushes off a little round cap, and ascends to the surface of the ground up the hole which the larva left in its descent. The fly then crawls upon some neighbouring grass or twig, and rests there until its wings and body have hardened. This takes a few days, but ultimately the stage of perfection is reached, and when the conditions are favourable it ascends into the air, and finds its way towards the sheep, where under suitable circumstances its life cycle is completed.

In combating the attacks of this fly, preventive measures are much more likely to be successful than curative. The nose and lower parts of the sheep's face should be dressed with a mixture of tar and fish oil, in equal parts, put on with a brush, at intervals of two to three days, during the periods at which the gad-fly is most prevalent. This would prevent the fly from depositing its larva in the nostrils.

THE FELTED BEECH COCCUS.

The scale insect known as the Felted Beech Coccus (*Cryptococcus fagi*, Barensprung) chiefly attacks the trunks of beech trees, but sometimes ascends into the boughs. The females produce larvæ in September ; these envelop themselves in a

white cottony secretion and then cast off their antennæ and legs, and remain for the rest of their life devoid of such appendages. The adult female is a small orange-yellow sac, surrounded by a white mass; these white masses often unite and form large felted patches, beneath which the larvæ burrow and develop.

These scale insects suck out the sap very greedily, and often do much harm when present in large quantities. In time they cause the bark to peel off the tree, after which decay and death of the tree may ensue. It has recently been reported to the Board as damaging trees at Castle Eden, Durham. Large numbers of trees are attacked by this insect in Surrey, and it is also common in Cheshire, Huntingdonshire, and probably occurs in greater or less abundance wherever the beech grows in Europe.

Trees attacked by the insect should immediately be sprayed with strong paraffin emulsion twice, at an interval of two days' In the winter they should be sprayed with the caustic alkali wash. Scrubbing the trunks of the trees is too costly a method if the attack is severe, and thorough spraying with warm paraffin emulsion is quite effective. If the trees are cut down the bark should be burnt at once.

It would appear that the weeping beech, of which two kinds are grafted on the common beech, is not affected by this coccus. The stock may be attacked, but not the "weeping" scion.

The insect does not appear to be attacked by birds, and very rarely by insect parasites.

FURNITURE BEETLES.

The so-called "Furniture Beetles" are usually known as "Death Watches"; they are beetles belonging to the genera *Anobium* and *Xestobium*. The group of beetles to which they belong are mostly found in old wood; several are found in houses, the two commonest being *Anobium domesticum* (Fourc) and *Xestobium tessellatum*, F. Eleven species of *Anobium* are found in Great Britain; the two previously mentioned and

A. paniceum L., and *A. mollis* L., are the domestic forms. Furniture and woodwork are chiefly damaged by *A. domesticum* and *X. tessellatum*. The species *A. paniceum* attacks all kinds of stored goods, such as flour, bread, biscuits, medical stores, skins, &c., and has been introduced into most of our towns, but appears not to be common in Scotland.

Anobium domesticum is a most destructive furniture pest, the larvæ eating galleries into the solid wood, and often so completely riddling it that it falls to pieces. Tables, chairs, and furniture generally, may become so honeycombed by these pests that they suddenly collapse. The exits to these galleries are seen as small round holes in the woodwork. In soft woods they soon cause complete destruction.

Xestobium tessellatum is also generally distributed, and occurs in old trees, such as oaks and willows, but especially in old wood in churches and houses. It is also rare in Scotland. Both these species make a curious ticking noise, which has given rise to their popular name of "Death Watch." This noise is made chiefly during the pairing season, and is produced by the beetles striking their heads upon the wood on which they are standing so as to attract their mates, who make a similar noise in reply. It is made during the day as well as at night, but it is not so noticeable as at the latter time. Several species make this ticking noise, but those most often heard in the house are *A. domesticum* and *X. tessallatum*. It is said that the larva can also produce this sound, but this is not definitely known.

The larvæ make long galleries into the wood and when mature pupate in little chambers, from which the beetles escape by eating their way out.

Treatment.—Where furniture or woodwork is attacked by these beetles and their larvæ, steps should be taken at once to destroy them, as they return generation after generation to lay their eggs on the same object until it crumbles away altogether. Amongst the best ways of treating attacked furniture are the following :—

(*a*) Painting with a camel-hair brush with corrosive sublimate. This poison kills the beetles as they make their exit.

(*b*) Fumigating with hydrocyanic acid gas. Where small objects such as chairs are invaded they may be put in some

closed cupboard and left in the fumes for some days. It must be remembered that this gas is a deadly poison, as well as the cyanide of potassium used in its manufacture.

(*c*) Benzine may also be applied to polished furniture, but is best used mixed with carbolic acid. Furniture so treated has, of course, the polish taken off and will require repolishing.

(*d*) Rooms in which the *Anobium* are present should be fumigated every week during July, either with sulphur or hydrocyanic acid gas, and then well washed down with carbolic. Of course, during fumigation all windows should have the crevices, &c., papered up and the doors tightly closed. Hydrocyanic gas must be used with great care and can only be employed in certain cases. It could not be used in high attics, as the windows must be opened from the *outside* so as to allow the fumes to escape from the room before anyone enters. In the case of attics where windows cannot be opened from the outside sulphur had best be used.

CLOTHES MOTHS.

Three species of small moths attack clothes, woollen articles, carpets, &c. These all belong to the group *Tineinae* and have now become almost cosmopolitan ; in origin they are probably Old World species.

The three species are the following :—

(i.) The Case-making Clothes Moth (*Tinea pellionella*, L.).
(ii.) The Webbing Clothes Moth (*Tineola biselliella*, Hum.).
(iii.) The Tapestry Moth (*Tinea tapetzella*, L.).

They are all common and very destructive in this country both in private houses and stores.

(i.) The Case-making Clothes Moth (*Tinea pellionella*, L.) is a small moth with a wing expanse of half an inch, the forewings are yellowish grey with three indistinct brownish spots, the hind wings and the wing-fringes grey. The larva feeds on all woollen goods, carpets, furs and feathers. The moth appears in February and there may be successive broods until November. In America there appears to be only one brood in the north the

moths appearing from June to August, but in the south there are two or more broods, the moths appearing from January to October.

The eggs are very small and are usually laid on the food material of the larvæ. The larvæ are small dull white caterpillars, the head reddish-brown, and the second segment with a dark brown plate behind. They form a tubular, slightly flattish case, in which they pass the whole of their existence, the head and first few segments and legs being protruded when the caterpillars move from place to place. This case has frequently to be enlarged as the larva grows; this is done by the insect making a slit half-way down the tube and inserting a patch of new material, then a similar slit is made and filled in on the opposite side, the same operation being performed at the other half of the case, the larva having previously turned round inside the tube. When the tube wants lengthening additions are simply made at each end of the tube. These larval cases are made of the material upon which the insects are feeding; change of food thus changes the colour of the case, and sometimes when feeding on variously coloured fabrics the cases are multi-coloured. Each case is lined inside by a fine white silk spun by the larva. When mature these cases are spun either to the substance upon which the larvæ have been feeding, or more often they wander to the walls and ceilings and then fasten the tubes firmly to the surface with silk. The pupal stage takes place inside the case and lasts from two to three weeks.

(ii.) The Webbing Clothes Moth (*Tineola biselliella*, Hummel) is about the same size as the preceding species and has the front wings pale ochreous and more or less shining, without any spots; the hind wings are whitish and the head reddish-yellow. The larva feeds on a great variety of substances, such as woollen goods, furs, feathers, the linings of chairs and sofas, and has even been found eating cobwebs. The moth appears from March to October and produces two broods in the year. The larva is dirty-white and spins a silken webbing as it progresses over its food material; no true case is formed as in the preceding species. But when mature it spins a cocoon of pieces of hair or wool of irregular outline, and pupates within it.

(iii.) The Tapestry Moth (*Tinea tapetzella*, L., also known as

Trichophaga tapetzella). The forewings of this moth are black from the base to the middle, then white clouded with grey towards the tip; the hind wings are pale grey, and the head is white. The wing expanse is about three-fourths of an inch. It appears during June and July. The larvæ form galleries, lined with silk, in the cloth or other substance attacked. They affect carpets, horse-cloths, upholsterings, especially in carriages; also furs and skins. The pupal stage takes place inside the galleries. Heavy and coarse materials are attacked mainly by this species, which damages by its actual burrowing into the material upon which its feeds.

Treatment for Clothes Moths.—Frequent removal, beating and shaking of clothes, &c., will do much to prevent the harm caused by these three pests. Materials which are liable to be attacked should be put away in boxes and cupboards, with pieces of naphthalene in muslin bags placed here and there. Exposure to sunlight and plenty of air in May or June will do much to prevent clothes from being spoiled by them. Benzine has a very decided effect on these pests, and any valuable materials might be treated now and then with this substance. In the case of cloth-covered furniture spraying with benzine is the most successful way of treatment. Large dealers of carpets and furs could keep their stock free from attack by adopting cold storage. A temperature of 40° F. is protective.

FOUL BROOD AND ITS PREVENTION IN IRELAND.

It is stated in the last report of the Irish Congested Districts Board that foul brood was very prevalent in 1901 in the counties of Donegal, Leitrim, Cork and Kerry, but that successful results were obtained where beekeepers allowed the expert to take the necessary measures for disinfection. Treatment with formalin is now generally adopted by the Board's expert and only very badly diseased stocks are destroyed. The hives are treated in all cases in which the presence of foul brood is detected at an early stage, and the experience gained indicates that when methods of disinfection are properly carried out the

disease, if dealt with before it has advanced too far, can be subdued, or entirely eradicated. The efficacy of the formalin treatment has, for instance, been exemplified in the Kilgarvan district, where about twenty-six stocks, which were affected by foul brood in the summer of 1900, were isolated and subjected to continuous treatment. When examined in the early summer of 1901 foul brood was discovered in only five of the stocks, the rest being apparently healthy. These healthy stocks were taken back to the apiaries to which they belonged, and when examined during the past summer they appeared to be still perfectly healthy.

In order to facilitate the adoption of measures for treating cases of foul brood the floor boards of the "Congested Districts Board" hives are now fitted with a large hole covered with perforated zinc and a sliding shutter, so that a cloth or sponge saturated with a 10 per cent. solution of formalin can be retained in the hole.

SHEEP-FEEDING EXPERIMENT.

Among the experiments conducted during 1901-1902 at the Cumberland and Westmorland Farm School, Newton Rigg, was a sheep-feeding trial. For this purpose 48 cross-bred Cheviot and Border Leicester hoggs were selected, and divided into three equal lots. An acre of swedes, yielding 23 tons of roots, of which the three lots received an equal share, was selected as a basis for the experiment, which began on December 3rd, 1901, when 32 of these sheep (Lots 1 and 2) were hurdled on the swede land, while Lot 3 got their share on a somewhat bare grass field. In addition to the roots, which were sliced and given to the sheep twice daily, Lot 1 got $\frac{1}{4}$ lb. of decorticated cotton cake and $\frac{1}{4}$ lb. of Indian corn per head per day, Lot 2 had $\frac{1}{4}$ lb. linseed cake and $\frac{1}{4}$ lb. of oats, and Lot 3 $\frac{1}{4}$ lb. linseed cake and $\frac{1}{4}$ lb. Indian corn. The three lots also received hay *ad libitum*.

After 24 days the corn ration fed to each lot was doubled, the amount of cake remaining as at the beginning of the trial.

The result was that the maize was eaten, but the additional oats were left by Lot 2, which were thenceforward fed as at the start. The table below gives the most important features of the trial, which extended over a period of 54 days.

In considering the results obtained, the low price of mutton at the time of sale and the manurial value of the foods consumed should be kept in view.

One noticeable point was the better killing weight furnished by the oat-fed sheep as compared with those receiving maize. The difference in the feeding value of the cotton and linseed cake was, however, apparently immaterial, while no advantage appears to have been gained by doubling the maize ration during the later stage of the trial.

Looking to the fact that during the latter half of the trial the weather was very wet and stormy, it would appear that the sheep folded on grass had some advantage over those on the turnip brake, both as regards mud and a certain amount of shelter derived from a wall breaking the west wind. These factors may have contributed towards the better results given by the sheep fed on grass. In addition, there was also a saving in food to the extent of about one ton of roots in their case.

	LOT I. Cotton Cake, Maize, Hay and Swedes.	LOT II. Linseed Cake, Oats, Hay and Swedes.	LOT III. Linseed Cake, Maize, Hay and Swedes on Grass.
Weight at commencement of trial ...	1,568 lb.	1,531 lb.	1,552 lb.
Total gain per head in 54 days	19·4 ,,	17·3 ,,	21·1 ,,
Total live weight ...	1,878 ,,	1,808 ,,	1,890 ,,
Percentage of dressed to live weight, exclusive of fat ...	50¼	52	50½
Selling price net ...	33s. 10½d.	34s. 8½d.	34s. 10d.
Gross profit ...	10s. 10½d.	11s. 8½d.	11s. 10d.
Value of food ...	5s. 6d.	5s. 2d.	5s. 1d.
Net profit per head ...	5s. 4½d.	6s. 6½d.	6s. 9d.

SUGAR BEET AS FOOD FOR SHEEP.

In 1900 experiments were carried out at the South-Eastern Agricultural College, Wye, to compare the food value of sugar beets and mangolds respectively for sheep. Two lots of

twelve sheep each, picked out as evenly as possible, were fed on uniform rations of dry food (maize, oats, and linseed cake); the sheep in each lot were given in addition mangolds or sugar beet *ad lib.* The results showed that in a period of twelve weeks the sheep fed upon mangolds gained in live weight, on an average, 40½ lb. per sheep as against 33 lb. for those fed upon sugar beet, the proportion of dead to live weight and the amount of wool in each case being practically equal. It was found that ten-elevenths of an acre of sugar beet would serve sheep as long as one acre of mangolds, each area providing succulent food for thirty-eight sheep for twelve weeks.

The sheep fed upon the mangolds, however, increased 7·6 lb. per head on the average more than those fed upon the beet; or, in other words, one acre of mangolds furnished 293 lb. more live weight than ten-elevenths of an acre of sugar beet. The cost of growing the mangolds was £8 15s. 9d. per acre, while to grow ten-elevenths of an acre of sugar beet cost £9 9s. 4d.

These experiments on the relative value of mangolds and sugar beet as food for sheep were repeated last year. The trial began on April, 1901, on two pens of sixteen sheep each, all of which were Romney Marsh ewe or wether tegs about thirteen months old, picked to get the two pens as nearly equal as possible at starting. One pen received mangolds, the other sugar beets, the amount consumed being weighed; each sheep in addition received 1 lb. *per diem* of a mixture consisting of oats, maize, and linseed cake. Water was given, and the folds on the grass were renewed from time to time.

The trial began on April 2nd and finished on May 28th, a period of eight weeks, during which the daily consumption of mangolds per head amounted to 19 lb. as compared with 13 lb. of beet. The average increase in live weight in the sheep fed upon mangolds was 30 lb., or 24·3 per cent., as compared with an average increase of 22 lb., or 18·0 per cent., in those fed upon sugar beet. Moreover, the sheep which had received mangolds handled better, and their wool looked brighter than in the case of those receiving sugar beet.

These results were, therefore, even more unfavourable to sugar beet than those obtained in the trials of the preceding year.

CATTLE-FEEDING EXPERIMENT.

An experiment to compare the feeding values of decorticated cotton cake and cotton seed meal was made in the winter of 1901-1902 on the farm at Lledwigan attached to the Agricultural Department of the University College of North Wales, Bangor.

For the purpose of the trial six Welsh bullocks were selected in November, from a herd of 24, which had been grazing together during the summer. They were put into boxes and similarly fed till the commencement of the experiment on December 13th. The bullocks were equally divided into two lots of three each, and at the beginning of the experiment the following daily rations were fed to them :—

LOT I.	LOT II.
4 lb. cotton seed meal	4 lb. decorticated cotton cake
4 lb. maize meal	4 lb. maize meal
70 lb. pulped swedes	70 lb. pulped swedes
10 lb. hay and straw chaff	10 lb. hay and straw chaff
5 lb. long hay	5 lb. long hay
water	water

After January 6th the concentrated food given to each lot was brought up to 10 lb. per bullock per diem by the addition of 1 lb. to the cotton cake and maize meal in Lot I., and to the cotton seed meal and maize meal respectively in Lot II.

The prices of maize meal, cotton seed meal, and decorticated cotton cake were £6 17s. 6d., £7 5s., and £7 12s. 6d. per ton respectively.

The bullocks were weighed at the beginning of the experiment and at its conclusion on February 28th. The particulars of the weighings are given in the following table :—

LOT I.										LOT II.									
No. of animal.	Live weight Dec. 13th.			Live weight Feb. 28th.			Increase in live weight.			No. of animal.	Live weight Dec. 13th.			Live weight Feb. 28th.			Increase in live weight.		
	C.	Q.	LB.	C.	Q.	LB.	C.	Q.	LB.		C.	Q.	LB.	C.	Q.	LB.	C.	Q.	LB.
1	9	3	0	10	2	20	0	3	20	1	10	1	4	12	0	6	1	3	2
2	10	1	8	11	1	16	1	0	8	2	10	1	12	12	0	0	1	2	16
3	10	1	0	11	2	12	1	1	12	3	9	2	8	10	3	5	1	0	25
Total	30	1	8	33	2	20	3	1	12	Total	30	0	24	34	3	11	4	2	15

		cwt.	qr.	lb.
Average increase in live weight in Lot I.	...	1	0	13
,, ,, ,, Lot II.	...	1	2	5
Average daily gain in live weight in Lot I.	...	...	1·62 lb.	
,, ,, ,, Lot II.	...	...	2·24 lb	

The total increase in live weight in Lot II. over Lot I., was 1 cwt. 1 qr. 3 lb., which, valued at 32s. per cwt., the price at which the cattle were sold, amounts to £2 0s. 10d. As, however, the 1,083 lb. decorticated cotton cake consumed by Lot II. cost 3s. 7d. more than the 1,083 lb. of cotton seed meal eaten by Lot I., the net value of the gain was £1 17s. 3d., or 12s. 5d. per head. The gross gain of £2 0s. 10d. produced by the consumption of 1,083 lb. of each of the trial foods is equivalent to a gain of £4 4s. 5d. per ton in favour of the decorticated cotton cake.

The results of this experiment are stated to confirm those of a similar trial made in 1900-1901 with two lots of four cattle each. It would therefore appear that, although there is not much difference between the market value of the two test foods used, the feeding value of decorticated cotton cake is altogether higher that that of cotton seed meal.

RESISTANCE OF BACTERIA TO PASTEURIZATION.

It was found at the Wisconsin Agricultural Experiment Station about two years ago that the tubercle organism is more resistant in milk when heated in open than in closed vessels, the cause of this difference being attributed to the formation of the surface pellicle ("scalded layer"), which readily forms on milk heated in open vessels to a temperature of about 140° F. or above. Professors Russell and Hastings have continued their researches on the subject with a view to ascertaining the reason why the destruction of bacteria in milk is subject to so much variation, and their conclusions have been published in the 18th Report of the Experimental Station.

They state that the destruction of bacteria in milk by means of heat depends upon the conditions under which the exposure is made. Where milk is heated so as to permit the formation

of the surface pellicle ("scalded layer"), the thermal death point of organisms is materially increased. This point has considerable bearing on the vitality of bacteria in connection with various methods of preservation (sterilization and pasteurization) that are applied to milk intended for direct consumption, or for butter-making. The destruction of pathogenic, or disease-producing, bacteria is a question of great importance, as the tubercle bacillus may retain its vitality for a considerably longer period in the scalded layer on the surface or milk. This relation of the surface membrane to the varying vitality of bacteria in milk is indicated both by the growth of organisms in the membrane at higher temperatures than in the milk below, and also by the sterility of membranes removed after the initial membrane has once been formed. The increased resistance of bacteria in the surface membrane is not entirely due to the lowering of the temperature at the surface, but it appears to be affected by the nature of the enclosing membrane itself.

RAILWAY RATES ON MERCHANDISE FROM ABROAD.

The following correspondence has passed between the Board of Agriculture, the Board of Trade, and the Hull and District Fruit Buyers' Association in consequence of representations made by the latter body as to alleged preferential rates charged by railway companies on the carriage of fruit and vegetables from the Continent, *viâ* Hull, to certain inland towns in this country.

The Board believe that it is not generally known that the amounts charged by railway companies for the carriage of goods by sea and by rail can be ascertained separately. They desire, therefore, to direct special attention to the statement in the reply by the Board of Trade, that railway companies which carry merchandise partly by land and partly by sea are bound to specify, in the rate books kept at the ports in the United Kingdom which they use, the proportion of any through rate appropriated to conveyance by sea, and that these books can be

inspected by any person during all reasonable hours without the payment of a fee:—

I.

From the Secretary, Board of Agriculture, to the Secretary, Board of Trade.

"*June* 18th, 1902.

"SIR,—I am directed by the President of the Board of Agriculture to inform you that representations have been addressed to him by the Hull and District Fruit Buyers' Association, Limited, with regard to the disadvantages suffered by the Hull vegetable and fruit trade owing to the action of the railway companies.

"It is alleged, in the first place, that preferential treatment is accorded by railway companies to consignments of fruit and vegetables despatched from the Continent, *viâ* Hull, to inland towns in this country. It appears, for example, that the through rate for onions in 4-ton lots from Rotterdam to Nottingham is 16s. a ton, including wharfage and labour in Hull, which must amount to about 1s., whereas if the onions are sent in the first instance to a Hull merchant, who afterwards forwards them, in the same crates and without breaking bulk, to Nottingham, the cost will amount to 20s. per ton, and will include the following charges:—

	s.	d.	
Rate for any quantity of onions from Rotterdam to Hull	8	6	per ton.
Rate for onions, in 4-ton lots, from Hull to Nottingham	10	0	per ton.
Wharfage	0	6	per ton.
Labour	1	0	per ton.

"Complaint is also made of the great delay in the conveyance of produce by goods trains, whereby produce put on rail at Hull, to be delivered in Liverpool or Manchester, arrives at its destination later than consignments despatched to these towns at the same time from London.

"The Association further represent that, while the canals would, in many instances, prove serviceable for the conveyance of vegetables and fruit, consignors are debarred from utilising these channels of distribution owing to the existence of agreements between the canal companies and the railway companies which bind the former to maintain their rates at what is

practically a non-competitive scale as compared with the railway rates.

"With reference to the foregoing points, Mr. Hanbury desires me to say that he understands that if the railway companies own lines of steamships they must, in certain cases at any rate, distinguish the sea from the land charges; and that he would be glad to learn (1) whether such an obligation is imposed upon all railway companies by a general statute, or whether it is to be found only in the private Acts of particular companies; and (2) whether, in cases where this requirement exists, the railway company is only bound to show the land and sea charges separately when requested by the payer of the charges to do so.

"Mr. Hanbury also wishes me to enquire whether, in cases where the railway company does not own any ships, but charges a through rate from foreign ports, the company is bound to make the same charge in respect of the land transit as if the goods had started from the British port and there had been no carriage by sea at all.

"With regard to the alleged agreements between the railway and canal companies in the neighbourhood of Hull, Mr. Hanbury would be glad to know whether the Board of Trade have any official knowledge of any such arrangements.

"I am, Sir,

"Your obedient servant,

"(Signed.) T. H. ELLIOTT,

"Secretary."

II.

From the Secretary, Board of Trade, to the Secretary, Board of Agriculture.

"*25th June*, 1902.

"SIR,—In reply to your letter of the 18th instant on the subject of a complaint made against the railway companies by the Hull and District Fruit Buyers' Association, Limited, I am directed by the Board of Trade to state that under the provisions of Sections 14 and 33 (5) of the Railway and Canal Traffic Acts, 1873 and 1888, respectively, railway companies which carry merchandise partly by land and partly by sea are

bound to specify in the rate books kept at the ports in the United Kingdom which they use the proportion of any through rate appropriated to conveyance by sea, and that these books can be inspected by any person during all reasonable hours without the payment of a fee.

"With regard to the other points on which Mr. Hanbury desires information, I am to point out that, under the provisions of Sub-section (2) of Section 27 of the Railway and Canal Traffic Act, 1888, no railway company may make any difference in the tolls, rates, or charges made for, or any difference in the treatment of, home and foreign merchandise for the same or similar services; and I am to add that the Board of Trade have no knowledge of any such arrangements between railway and canal companies as are referred to in your letter.

"I am, Sir,

"Your obedient servant,

"(Signed.) FRANCIS J. HOPWOOD."

III.

From the Secretary, Board of Agriculture, to Richard Lewis, Esq., Hon. Secretary, Hull and District Fruit Buyers' Association.

"14*th August*, 1902.

"SIR,—I am directed by the Board of Agriculture to advert to your letter of May 9th last, and to say that they have been in communication with the Board of Trade upon the subjects referred to therein, and in the subsequent interview which took place between an Inspector of this Board and a member of your Association.

"With regard to the alleged preferential treatment by railway companies of consignments of fruit and vegetables despatched from the Continent, *via* Hull, to inland towns in this country, the Board are informed that, under Section 27, Sub-section 2 of the Railway and Canal Traffic Act, 1888, no railway company may make any difference in the tolls, rates, or charges made for, or any difference in the treatment of, home and foreign merchandise for the same or similar services; and that under

the provisions 'of Sections 14 and 33 (5) of the Railway and Canal Traffic Acts, 1873 and 1888, respectively, railway companies which carry merchandise partly by land and partly by sea, are bound to specify in the rate books kept at the ports in the United Kingdom which they use the proportion of any through rate appropriated to conveyance by sea, and that these books can be inspected by any person during all reasonable hours without the payment of a fee.'

"The Board are further informed that the Board of Trade have no knowledge of the existence of any agreements between the railway and canal companies whereby the latter are bound to maintain their charges for the carriage of produce at what is practically a non-competitive level as compared with the railway rates.

"I am to add that the Board have no objection to your giving such publicity to this letter as you may consider desirable.

"I am, Sir,

"Your obedient servant,

"(Signed.) T. H. Elliott,

"Secretary."

Analyses of Imported Agricultural Produce.

The Annual Report of the Principal Chemist of the Government Laboratory for the year ending March 31st, 1902, indicates that 2,454 samples were analysed during the year on behalf of the Board of Agriculture. This total included 1,703 analyses of imported butter, 232 of imported cheese, 13 of imported fresh milk, 91 of imported condensed milk, and 14 of imported cream, besides one analysis of a feeding stuff and two of manure and blood. None of the samples of imported butter were found to be adulterated, but 619 contained boric preservative, and 307 were artificially coloured.

The samples of cheese examined did not include any of margarine cheese. The amount of fat, however, in several instances was very small, falling as low as 1·0 per cent. in one sample and 2·3 per cent. in another.

Of the 91 samples of condensed milk taken, only two, both of which came from Belgium, were reported against. An unfavourable report was also made on one sample of fresh milk imported from Italy. The remaining twelve analyses of imported fresh milk gave satisfactory results.

CELERY CULTURE IN THE UNITED STATES.

In No. 148 of their "Farmers' Bulletins," the United States Department of Agriculture have issued detailed information as to the practice followed in the cultivation of celery in that country. Celery growing, on a commercial scale, made its greatest progress in the United States after the opening and draining of the "muck-bed" areas of the Great Lake Region, where there are several thousand acres under cultivation. It is also grown in California and Florida, where, owing to the warmer climate, it matures at a different period; so that celery is upon the market practically from August, or earlier, until April.

In the production of celery for domestic use, a rich, mellow, sandy loam gives the best results. Nitrogen forms the principal plant food of celery, so that the soil will soon become deficient in this element unless means be provided for its restoration. This may be done either by the application of large quantities of manures containing a high percentage of nitrates, or by planting leguminous crops during one or more years between the celery crops. Potash and phosphates are also required by the crop, but the amount depends upon the condition of the land. The manure should be applied either late in the autumn or very early in the spring, so that it may be thoroughly incorporated with the soil before the celery is planted.

The preparation of the ground consists in ploughing, preferably in the autumn, so that it may be exposed to the action of frost during the winter, after which the soil should be pulverised to a depth of 4 or 5 inches with harrow and roller immediately before planting the celery.

For an early or small crop the seed is usually sown in January

or February in sifted soil in a wooden tray which can be placed in the window of a moderately warm room; but with later plants, for the main crop, it is sown in a cold frame or in the open ground about March or April. The seedlings are transplanted; and where small quantities only are grown the transplanting is sometimes done twice.

For domestic use, where plenty of land is available, it has been found most economical to plant in single rows 4 to 6 feet apart, with the plants 6 or 7 inches apart in the rows. If the space is limited, beds about 5 feet wide are suitable, with the plants set 7 inches apart each way. On the "muck" soils the ground is not mulched around the plants after setting; but some kind of covering is desirable on sandy land and necessary on clay soils, and the ground is covered with finely divided material, preferably half-rotted manure, to a depth of about 2 inches for 8 or 10 inches on either side of the plants.

Where celery is planted in single rows and mulched, shallow cultivation only is maintained between the rows: the teeth of the machine are not allowed to come near the plants, nor is the cultivation deep, as the roots are near the surface. Where no mulch is used the surface is slightly stirred with a hoe or iron rake, to prevent the formation of a crust after rain or watering.

In its original wild state the celery stem is tough, woody, and of rank flavour, and to remedy this the stems are blanched. Some varieties are, in a measure, self-blanching, while others require to have all light excluded. If for early use, the self-blanching kinds are selected, and the blanching is completed when the roots are grown; but with celery for winter use, the process is done after storage, as it keeps better when unblanched,

Various systems of blanching are adopted in the United States. One method for early blanching is to use boards 12 to 14 inches wide, two of which are placed on edge on either side of the row of plants. They are kept in position in different ways, but frequently by the use of a piece of galvanised wire, about 6 inches long, bent at each end. These are slipped over the edges of the boards to keep them from falling outwards, and the plants are rigid enough to keep them upright. The cheaper

grades of pine are used, but new boards are liable to impart a flavour to the celery. Ordinary farm drain tiles, of about 4 inches inside diameter, are also often used for early celery, and this has been found a very satisfactory method. Common unglazed pipes are placed over the celery when it is almost full grown, some of the outside leaves being first pulled away and the main part of the plant loosely tied together. The commonest method of blanching on a small scale is, however, by banking with soil.

Celery for winter use is generally not blanched at all, as the necessary blanching will take place while the crop is in storage, and only enough earth is placed round the base of the plants while in the open ground to secure an upright and compact growth.

When only a small quantity is grown, the celery is stored by first banking it up with earth to a height sufficient to keep the plants in good form, and afterwards, when hard frost is expected, the earth is thrown up to the tops of the plants and the ridge covered with coarse stable manure, straw, &c., held in place by means of old boards. The celery is not allowed to freeze.

Large growers treat the last of the crop by the method known as trenching. The crop remains in the ground till hard frost is expected, when boards are set up about 18 inches apart, between which the celery is packed with the roots in soil. The soil is thrown up on the outside to the tops of the boards, which are then lifted out and the soil allowed to come in contact with the celery. A covering of boards, straw, &c., is placed over the tops in cold weather. Another method of trenching is to dig a pit about 2 feet deep and 3 feet wide, and pack the celery in this with the roots close together in the soil. It is then watered and allowed to remain open long enough for the tops to become dried off. The trench is covered with boards and straw placed on this to keep out the cold. In some cases large growers use a special celery store house.

CURING AND PRESSING HOPS IN CALIFORNIA.

Hops are dried in California immediately after picking by spreading them on an elevated floor of slats covered with a

carpet of burlaps, and heating the air beneath, so that it rises through the hops, carrying off the moisture. These structures are known as kilns, and are of many kinds, but the essential features are as follows:—The building is made of boards, and usually lathed and plastered; it is from 16 to 30 feet square, the height to the plate being 20 to 24 feet. The roof runs up with a steep slant from each of the four sides nearly to a point at the top, where is located the opening, about 3 feet square. About 4 feet below the plate is the drying floor, made of slats 1 to 2 inches wide, with spaces of the same width between them. The space below this constitutes the stove room, in which the air is heated by means of a stove or furnace, with pipes extending from it to a flue at the side, so as to expose a large surface to the air. The air can enter freely from outside near the ground.

There are many variations from the typical kiln described above. On the Californian coast the latest development is what is known as the double-hopper kiln, with the cooling or storage room located about 200 feet away as a precaution against fire; but it seems to increase the danger of fire in the kiln itself.

The elevation of the drying floor should not be less than 20 feet, as a precaution against scorching the hops. The prime object is to secure a good draught, the air coming in cool at the bottom, becoming heated in the stove room, passing through the layer of hops, and out at the top, laden with moisture. To increase this draught experiments have been made with rotary fans; these have not proved a success up to the present, but greater economy and despatch in drying hops may be looked for in the future.

Many kinds of stoves are used in hop drying, and good ones have been made by adapting old locomotive boilers.

There must be plenty of holes close to the ground to let the cold air in, as the upward motion of the air must be as rapid, free, and continuous as possible. These draught holes should be fitted with shutters. The kiln is commonly built on a brick foundation as high as 3 or 4 feet from the ground, apertures being provided in the brickwork for ventilation.

On one side of the kiln a platform is erected on a level with

the drying floor. To this platform the green hops are elevated, and from it they are passed in through a door. Various means are employed for raising the hops to the drying floor ; in some cases inclined driveways are erected up which loaded waggons are driven, but more commonly the hops are drawn up from the ground by an elevator or crane.

The slat floor of the curing room rests on strong joists or girders. Over this floor is spread, to receive the hops, a kiln cloth or carpet, usually of flax or hemp, made of small hard-twisted threads loosely woven, so as to allow the air to pass through freely. The hops are spread out on the drying floor as evenly and lightly as possible, from 18 to 24 inches deep.

As to the height to which the temperature should be raised and the number of hours necessary for properly curing the hops, there are many differences in opinion and practice. In California it is customary to dry a flooring of hops every twelve hours, using a sufficiently high temperature to do the work in that time. A fresh batch of hops is laid on the drying floor at noon, and another at midnight. The temperature usually varies between 125° and 140° F., but it is chiefly a question of judgment. If the fire has been properly kept up, by 9 or 10 o'clock the hops around the side of the kiln will begin to rattle. It is then time to turn them, as the top hops are the slowest to dry. This is done with a wooden barley fork, or by walking through them, and thus ploughing them up with the feet ; in the latter case the feet should be dragged along the floor to avoid stepping on the hops. On an average, it takes about three-fourths of a cord of willow wood to dry 1,000 lb. of hops (dry weight).

The colour of the hops seems to depend largely on climate and soil. In Sonoma county the golden colour seems to result from the bleaching effect of fogs and heavy dews ; that of the hops grown around Sacramento is attributed to the soil. The principal demand is for yellow or straw-coloured hops, which has led to the custom of bleaching or sulphuring. To produce this, the process of bleaching with the fumes of burning sulphur is carried on in connection with the curing of the hops ; about 1 lb. of sulphur being used for every 100 lb. of green hops.

The sulphur further accelerates the drying, and assists in preserving the product.

When the process of curing is completed the hops are prepared for shipment by pressing into bales. The press in general use on the Pacific coast produces a bale 20 inches square at the ends, and 5 feet long, weighing from 175 lb. to 250 lb. From forty to seventy-five bales can be pressed in a day. The box used for pressing is 20 inches wide, 5 feet long, and 8 to 10 feet deep, and is surrounded by a strong framework of scantlings. This "baler" is placed beneath the cooling-room, a hole being cut in the floor as large as the mouth of the box, down which the hops are shovelled until the box is filled. The pressing is effected by means of rods, racks, and a fly-wheel worked by horses.

[*United States Department of Agriculture Farmers' Bulletin No.* 115.]

EXPORT OF FROZEN MEAT FROM ARGENTINA.

The Board of Agriculture have received a despatch from H.M. Consul at Buenos Ayres relating to the frozen and chilled meat industry of Argentina.

The frozen meat trade in that country, which began in the year 1883 with an export of 17,000 carcases of sheep, has grown steadily every year, and in 1901 the total exports amounted to 3,100,000 carcases of sheep, 133,000 of cattle, and 500 pigs.

There are at present three companies engaged in the trade, —the Sansinena Company at Barracas, just outside the city of Buenos Ayres; the River Plate Fresh Meat Company at Campana, on the River Parana; and the Las Palmas Produce Company at Zárate on the same river. These three companies represent a capital of some £800,000 sterling, employ 2,000 hands, and have a capacity of 15,000 sheep and 720 cattle per twenty-four hours.

The weight of meat and other products which passed through these factories in 1901 was as follows:—Preserved meat (tinned meat), 228 tons; frozen meat, 112,000 tons; grease, 859 tons;

hides 14,000 tons; tallow, 14,400 tons; sundries (blood, bones, &c.), 6,000 tons; giving a total of 147,487 tons.

The expense of running the factories is stated to have amounted to £2,743,055, made up as follows:—Staff, £164,725; purchase of stock, £2,416,665; fuel, £45,000; sundries, £116,665.

The freezing companies buy the cattle direct from stock owners, slaughter, clean and freeze them on their own premises, and make regular shipments of the meat on their own steamers, or on steamers with which they have contracts for the purpose. The companies never freeze and store for shipment the meat of private owners. This method is said to have undoubtedly kept down the prices of live stock since the closing of the British ports to Argentine animals, as there is practically no competition among the companies. On the other hand, it is held to have ensured the supply only of good meat, carefully slaughtered, cleaned, and prepared. The trade has been reduced to so regular a system that there is no break in arrivals in England, no excessive storage charges are incurred on either side, and no stale carcases are put on the market. Most of the Argentine frozen meat is landed in Liverpool, the remainder being landed at London, Cardiff, Newcastle, Hull, and Southampton.

In 1901, thirty-three steamers were regularly employed in this trade between England and Argentina, having a total carrying capacity of 1,443,000 carcases of mutton of 56 lb. each.

This trade has not in any way affected the old-established industry of drying and salting beef called "charque," the countries of consumption and the customers being entirely different in each case.

It is reported that two more freezing companies have been floated and will shortly erect the necessary buildings and machinery, one at La Plata and the other close to Buenos Ayres.

LIVE STOCK IN GERMANY.

The results of the German census of animals, taken on December 1st, 1900, show that there has been an increase in

the Empire in the number of horses, cattle, swine, and goats, but a decrease in sheep.

The number of horses has increased by about 360,000. Of the total number (4,195,361), 138,845 are army horses, while out of the animals of four years of age and over 2,390,502 are exclusively or mainly used for agriculture. This number is only very slightly in excess of that reported in 1892 (2,384,386), while army horses have increased by 12,000 and other horses over four years by 220,000. The number of foals returned as having been born during the preceding twelve months amounted to 228,987.

	1900.	1892.	1883.
	Number.	Number.	Number.
Horses: Under 4 years	851,215	—	—
4 years and over	3,344,146	—	—
Total horses	4,195,361	3,836,256	3,522,545
Cattle: Under 1 year	4,322,417	6,045,641	5,069,132
,, 1 to 2 years	2,764,856		
,, 2 years and over: Bulls ...	133,252	185,252	185,035
,, ,, Cows & heifers	10,458,631	9,946,164	9,087,293
,, ,, Other cattle ...	1,260,536	1,378,637	1,445,204
Total cattle	18,939,692	17,555,694	15,786,664
Sheep: Under 1 year	2,686,092	3,772,849	4,491,088
,, 1 year and over	7,006,409	9,816,763	14,698,627
Total sheep	9,692,501	13,589,612	19,189,715
Swine	16,807,014	12,174,288	9,206,195
Goats	3,266,997	3,091,287	2,640,994
Poultry: Geese...	6,239,126	—	—
,, Ducks	2,467,043	—	—
,, Fowls	55,395,837	—	—
,, Turkeys	351,165	—	—
,, Guinea-fowl	120,071	—	—

Germany possesses but a very small number of mules and asses, the number in the whole Empire amounting to but 649 mules and 7,199 asses.

The number of cattle shows an increase of about 1,400,000 during the previous eight years. This augmentation, however, is

due mainly to young cattle under two years old and to cows. Of the cattle of two years and over, cows (and heifers) have increased at every census since 1873, when they numbered 8,961,221; while steers and oxen have shown a progressive decline, the total drop since 1873 having been 304,205. There is a rather remarkable drop in the number of bulls over two years old, these being just 52,000 fewer in 1900 than in 1892. But this is apparently to be chiefly explained by a change in the age of the bulls kept for breeding, for there were 133,387 bulls between one and two years old used for breeding in 1900, as compared with 96,333 of this age in 1892. The number of calves born in the year is put at 7,616,927.

Sheep have continued the decline which has been so apparent of late years. Since 1873 the decrease has amounted to 15,306,905 head, or over 61 per cent. of the number then existing, and the diminution in the last eight years has been 3,897,000. The decline is equally marked in all classes of sheep.

Pigs, on the other hand, have shown a correspondingly rapid rise. In 1873 there were only 7,124,088, and this number has now been considerably more than doubled. Almost exactly half the number are under six months old.

The number of poultry is given in the accompanying table. No comparison can be instituted with previous years.

The progress of bee-keeping has been considerable since the last census, the number of stocks having risen from 2,034,479 to 2,605,350. Nearly the whole of the increase has been in hives with movable combs (1,151,771), which are rapidly displacing the other kinds, now numbering 1,453,579. The honey yielded in 1900 (exclusively from stocks which had been brought through the winter) amounted to 32,960,000 lb., of which about 17,825,000 lb. were produced from hives with movable combs.

In addition to particulars of the number of animals, their live weight and value were in some cases also estimated. Considering only mature animals, it may be noted that the live weight of cows and heifers of two years and over was 4,525,000 tons; and that of bulls and oxen 726,000 tons. These totals indicate that the average live weight of a cow was about

966 lb. (937 lb. in 1883), of a bull 1,205 lb., and of other steers or oxen 926 lb. The live weight of bulls and oxen was not given separately in 1892, but, taking them together, their average live weight has increased from 1,093 to 1,166 lb.

The total selling value of the horses is estimated at £117,603,000; of the cattle, £209,160,000; of the sheep, £19,790,000; and of the swine, £45,686,000.

AGRICULTURE IN URUGUAY.

In his annual report to the Foreign Office on the trade of Uruguay for the year 1901, Mr. Consul Harvey states that the principal exports from Uruguay are live stock, wool, jerked beef, hides, extract of beef, slaughter-house products, agricultural products, and provisions for vessels. The value of live stock exported in 1901 was £100,730, together with £5,517,260 of slaughter-house products, and £121,840 of agricultural products. The imports of live stock comprised 113 horses, 1,022 rams, including 352 from the United Kingdom; and 118 bulls, including 111 from the United Kingdom.

The total production of wool in Uruguay is estimated to be roughly 45,000 tons, divided into the following classes:—(1) Extra superior in fineness and quality, about 14,000 tons; (2) good, clean wool, not quite first-class, some 12,000 tons; (3) second-class wools of good quality, but not so fine as the above, about 10,000 tons; and (4) fine and coarse crosses amounting to 2,000 tons; 2,500 tons of lambs' wool ("borrego"), and 4,500 tons of belly wool. The value of the whole wool clip for the last two seasons ending 1901 and 1902 was approximately £2,500,000. The prospects for the next season are encouraging, and, owing to the reduction of scab, and the comparatively small mortality amongst the lambs, some considerable increase may be expected.

The principal crops grown in Uruguay are maize, wheat, and a little linseed. Oats, barley, and bird seed are also grown in very small quantities. The wheat crop of the season 1900-01 was the worst since 1892, owing to the prolonged drought. The

area under wheat was 683,000 acres, and the returns give the crop at 99,720 tons, against 187,376 tons in the previous year. Estimates for the new season's crop indicate that there will be about 300,000 tons available for exportation. The maize crop for 1900-01 was a good one, being returned at 141,648 tons, almost double that of the season before; the area under cultivation was 448,450 acres.

[*Foreign Office Report, Annual Series No.* 2847.]

FORESTS IN PRUSSIA, 1900.

According to the results of the Agricultural Inquiry of 1900, there were in that year in Prussia 20,427,000 acres under woods and forests, or 23·7 per cent. of the whole area of the country. Forests cover relatively the greatest area in Hesse-Nassau, Hohenzollern, and Brandenburg, where they amount to more than a third of the total area.

6,317,000 acres (or 30 per cent. of the total) were State forests; 184,000 acres belonged to the Crown, 3,000 acres Crown joint ownership, 2,726,000 acres to local authorities, 242,000 acres to institutions, 584,000 acres to associations, and 10,377,000 acres, or just over half the total, to private individuals.

6,315,000 acres were leaf forest, and 14,112,000 acres were conifers. The first consisted of 1,622,000 acres of coppice (oak coppice, osier beds, and various stool shoots, with or without a very few standards), 526,000 acres of coppice with standards (stoolshoots with numerous standards), 615,000 acres of uneven-aged high forest, and 3,553,000 acres of even-aged high forest. The conifers comprised 1,744,000 acres of uneven-aged high forest and 12,368,000 acres of high forest. Leaf forests are commonest in Hesse-Nassau, Rhineland, and Westphalia; conifers in Brandenburg and Silesia.

The even-aged high forest comprised 890,000 acres of oaks, 401,000 acres of birch, alder, and aspen, 2,250,000 acres of beech and other leaf trees, 10,256,000 acres of Scots pine, 17,000 acres of larch, 1,994,000 acres of spruce, and 31,000 acres of silver fir, in addition to some mixed woods. In the even-aged high forest

1,399,000 acres were trees over 100 years old, 1,448,000 acres of 81—100 years, 2,102,000 acres of 61—80 years, 3,137,000 acres of 41—60 years, 3,652,000 acres of 21—40, and 3,641,000 acres under 20 years old. There were also 230,000 acres of under-stocked areas, and 306,000 acres of bare ground.

Returns of production were required from each proprietor for the year ending 1st June, 1900. The total yield of wood was 861,036,000 cubic feet. Of this 637,648,000 cubic feet was solid wood (341,184,000 cubic feet serviceable timber and 296,464,000 cubic feet firewood) and 223,388,000 cubic feet of stumps and branches. The oak coppice gave 2,709,000 cubic feet (weighing 47 lb. per cubic foot) of oak bark; the osier beds 3,408,000 cubic feet (weighing 38 lb. per cubic foot) of willow rods, and 1,810,000 cubic feet of other wood. Adding all these items together the total production amounts to 868,963,000 cubic feet, or 43 cubic feet per acre of the total forest area.

RUSSIAN EXPORTS OF POULTRY, GAME, EGGS AND MEAT.

The Board have recently received from the Foreign Office a copy of a despatch supplied by Mr. Henry Cooke, H.M. Commercial Agent at Moscow, on the subject of the export of game, poultry and eggs from Russia to Great Britain. Mr. Cooke refers in the first place to a report made by Prince Stcherbatoff, President of the Moscow Imperial Agricultural Society, who alluded to the arrangements made for the construction of chilling and cold storage premises to take 500 tons of game and poultry, and for separate premises for a similar quantity of eggs. Special refrigerated trucks, &c., for the journey to Libau from the interior of Russia are also projected. In addition to these measures, Russian traders have applied for credit from the State Bank to enable them successfully to compete for the British market. The possible supplies of the above products from the south of Russia are said to be illimitable.

The quantity of eggs received from Russia has, as will be seen from the following Table, increased in recent years both absolutely and relatively, Russia now contributing about 26 per cent.

of the total imports, whereas in 1897 only 22 per cent. were credited to that country :—

Year.	Eggs imported into the United Kingdom.			
	Number.		Value.	
	From Russia.	From all countries.	From Russia.	From all countries.
	Millions.	Millions.	£	£
1897	376	1,684	812,300	4,356,800
1898	438	1,731	966,100	4,457,100
1899	518	1,941	1,183,000	5,044,400
1900	483	2,026	1,109,600	5,406,000
1901	539	2,049	1,207,500	5,495,800

The very large quantities sent to the United Kingdom represent, however, only one-third to one-fourth of the total exports of European Russia, which during the past four years have been as follows :—

1898	...	...	1,831 millions.
1899	...	...	1,685 do.
1900	...	...	1,780 do.
1901	...	...	1,996 do.

Of the total in 1901, 786 millions were sent to Germany, which is Russia's principal customer.

With regard to poultry and game, the imports from Russia into this country have not exhibited any marked increase, and, in fact, they can hardly be said to be maintaining their position in proportion to the increase in the total trade. The figures are as follows :—

Imports of Poultry and Game into the United Kingdom.		
Year.	From Russia.	From all countries.
	£	£
1897	186,800	730,700
1898	164,500	637,500
1899	139,800	785,300
1900	199,300	1,010,400
1901	180,700	980,800

The Annual Statement of Trade for the United Kingdom only gives the value of these imports, but the Russian returns distinguish the quantity of live and dead poultry and game sent

to this country. These particulars are shown in the Table below together with the total trade :—

	Exports of Poultry from Russia.					
	1899.		1900.		1901.	
	To the United Kingdom.	To all countries.	To the United Kingdom.	To all countries.	To the United Kingdom.	To all countries.
Live geese No.	1,000	4,999,000	27,000	5,303,000	5,000	5,641,000
Live poultry, No.	39,000	2,547,000	10,000	2,778,000	10,000	2,458,000
Dead poultry, cwt.	*	89,000	81,000	112,000	85,000	145,000
Dead game cwt.	†	16,000	4,500	24,500	4,500	18,300

* 1,315,000 head. † 373,000 head. Dead poultry and game are now returned by weight instead of by number, and in 1900 the number of all kinds, live and dead, exported was about 11½ millions, of which 2¼ millions were sent to this country.

As the future exportation of meat appears also to be contemplated in Russia, it may be noted that the imports and exports of cattle from Russia by the European and Black Sea frontiers during the past three years have been as follows (according to the Russian Preliminary Trade Returns for 1901) :—

	Imports. No.	Exports. No.
1899 ...	31,000 head ...	7,000 head
1900 ...	21,000 „ ...	8,000 „
1901 ...	31,000 „ ...	6,000 „

It may be observed that the number of cattle in European Russia (60 Governments) in 1900 was 35,917,000, compared with 27,622,000 in 1888, or an increase proportionately to the population from about 300 to 350 head of cattle per 1,000 persons. Among other countries, in the United States there are about 910 head of cattle per 1,000 persons ; in Argentina, 4,750 per 1,000 ; and in Australasia 2,200 per 1,000. There are several countries not possessing relatively large numbers of stock, such as Holland, Austria-Hungary, Italy and Servia, which carry on a small export trade in cattle.

Agricultural Experiment Stations.

The Office of Experiment Stations of the United States Department of Agriculture has recently published the result of an enquiry as to the number of agricultural experiment stations and kindred agencies in the principal countries of the world. The total number of experiment stations and similar institutions in the world, according to the result of the enquiry, is about 780. This number includes, however, many types of institution, such as experimental farms and fields, laboratories for miscellaneous analysis, and co-operative enterprises; but as a matter of convenience, all these agencies are referred to collectively as "stations."

The largest number of separate agencies for investigation and experiment in agriculture is said to be found in Russia, in spite of the fact that the movement is comparatively recent there. There are 102 such establishments and 3 experimental forests. Many of them are small demonstration fields, established for the purpose of instructing the peasants or of introducing new agricultural industries; others serve as centres for the production and distribution of improved varieties of seeds and plants, and some are conducted as institutions for research. There are also a number of stations for special crops, such as tobacco, beet-sugar, silk, cotton, olive, tea, wine, and other products.

If the same class of institutions were designated as experiment stations in the United States, the latter country would, it is held, without doubt show the second largest number of agencies, and probably the largest number of what are commonly regarded as experiment stations—that is, eliminating laboratories, which are purely for control or analytical work, demonstration fields &c. But including all these agencies in the definition of experiment stations, Germany is second in numerical order, and France third.

The total number of stations in Germany is given as 80, which includes about a dozen control stations and laboratories for miscellaneous analysis, together with a number of stations for special industries. The only bond of union between the German stations is the Association of Agricultural Experiment

Stations in the German Empire, which was organised at Weimar, in 1888, for the purpose of securing uniformity in methods of control work; and this does not comprise all of the stations.

The agricultural stations and laboratories of France, of which there are said to be 70, are under the general direction of an inspector general, an officer of the Ministry of Agriculture.

It is stated that the American stations represent a distinct type of institutions, which are the product of their environment. They are an adaptation of the European stations to the conditions and the requirements of the United States. Excluding the branch stations established by the several States, the total number of agricultural experiment stations in operation under the Act of Congress of March 2nd, 1887, is 54.

Austria has 40 stations. These are under the control of the Ministry of Agriculture, which also issues an official publication containing reports and papers on various phases of station work.

In Great Britain about 30 institutions are enumerated, including 12 that may be regarded as stations, 10 institutions which are subsidised by the Board of Agriculture, and 7 botanic gardens.

Belgium has a system of 16 stations, 7 of which are analytical laboratories, all under the supervision of the Belgian Ministry of Agriculture. Hungary likewise has 16 stations, under the supervision of the Central Commission of Experiment Stations, which provides an organ for the publication of their work; and Italy has 15 stations and laboratories, which receive a portion of their appropriation from the Government, many of them also receiving funds from the province or municipality in which they are located, and from local agricultural associations and chambers of commerce.

In the Netherlands there are 7 stations, including a seed-control station and a laboratory of vegetable pathology, besides a system of experimental fields, 11 in number, conducted under the auspices of local agricultural and horticultural societies, but subsidised by the Government.

Sweden has 26 stations, controlled and partially supported

by the State Department of Agriculture, most of which are chemical and seed control stations. In addition there are 10 agricultural chemical stations, maintained by societies, which are in reality laboratories for analysis and control. Norway has 11 stations, including several control stations, all, with one or two exceptions, under the direct control of the Department of Agriculture; Denmark has 10 stations, several of them being among the most liberally supported of the European stations.

A feature of the system in Australia, which includes 34 institutions, is the State farms, of which there are 16 scattered over the country, devoted for the most part to experiments and demonstrations in farming, the improvement of live stock, and similar work, but having no real scientific work connected with them.

In Japan there are 15, including 9 branch stations; in Switzerland a system of 10 stations, all under the control of the Department of Agriculture, except 1 for brewing: and in Spain 9 stations, 6 of which are oenological and 1 sericultural.

AGRICULTURAL DEPRESSION IN ARGENTINA.

H.M. Consul at Rosario has reported to the Foreign Office that there was much distress among agriculturists in his district at the close of the year 1901. They had sustained a considerable loss by the wheat crop of 1900–01, and they were threatened with a much heavier loss on the 1901–02 crop of wheat, linseed, and maize. The cause is the prolonged periods of drought, which caused a loss of the whole crop in some districts, and from 40 to 60 per cent. elsewhere. One of the Entre Rios railway lines offered to provide seed to the farmers along its route, on liberal terms, to enable them to meet the difficulties, and other lines were expected to assist in like manner.

Climatic influences in recent years have caused several losses to the grain crops, but the primitive methods employed by large numbers of the farmers have undoubtedly contributed in a great measure to the unsatisfactory results obtained by grain growers in the Argentine Republic. The National Government has

ordered an investigation with a view to ascertaining what steps should be taken to ensure a more uniform or improved yield of the various classes of grain cultivated.

The scarcity of reliable imformation and the contradictory statements made as to the real extent of the damage caused by the drought make it difficult to estimate the probable amount of grain which will be available for export during the year 1902, but the following forecast may be given. The Table also gives the exports from Rosario during the previous two years, and indicates the estimated extent of the damage sustained by the 1901–02 crops through prolonged periods of drought.

Crops.	Estimated Total Exports.	Exports from Rosario.		
	1902.	1902. Estimated.	1901.	1900.
	Tons.	Tons.	Tons.	Tons.
Wheat ...	400,000	50,000	421,009	809,000
Linseed...	280,000 to 300,000	80,000	153,857	64,000
Maize ...	1,000,000 to 1,200,000	180,000 to 200,000	273,549	202,000

[*Foreign Office Report, Annual Series, No.* 2,793.]

UNITED STATES IMITATION BUTTER LEGISLATION.

An Act which has recently come into operation in the United States of America makes important alterations in the law regarding imitation dairy products in that country. Hitherto all manufacturers of oleomargarine were required to pay a tax of £125 yearly, while wholesale dealers in this substance paid £100, and retail dealers £10. On and after July 1st last, however, wholesale and retail dealers, who sell no other oleomargarine or butterine except that which is free from artificial colouration causing it to resemble butter of any shade of yellow, are only to be taxed to the extent of £42 and 25s. respectively. Dealers who do not come under this description are taxed on the old scale. A further tax of 5d. per lb. is to be paid by manufacturers of oleomargarine

coloured to resemble butter, while only ⅛d. per lb. is payable on oleomargarine not so coloured.

The term "adulterated butter" is to be applied to any butter produced by mixing or rechurning in milk or cream, refining or remelting and mixing butter or butter-fat to obtain an improved product; to butter in which any chemical or other substance is introduced for the purpose of removing rancidity, or with the object of cheapening the product; and to butter which has undergone any process by which it has absorbed abnormal quantities of water, milk, or cream. Butter which has been subjected to any other process by which it is melted, clarified, or refined, and made to resemble genuine butter is to be known as "process butter" or "renovated butter." Manufacturers, wholesale and retail dealers in adulterated butter are subjected to the same taxation as those dealing in artificially coloured oleomargarine, while the tax on manufacturers of renovated or process butter is £10 yearly.

All adulterated butter is to be packed by the manufacturer in wooden packages not before used for that purpose, each containing not less than 10 lb., and marked as prescribed. Dealers in adulterated butter must sell only original or from original stamped packages, and when such original stamped packages are broken, the adulterated butter sold therefrom shall be placed in suitable packages marked as prescribed by the Revenue authorities. All process or renovated butter must be so marked, and any other marks, labels or brands added in such a manner as may be prescribed by the Secretary of Agriculture. The Act further provides for the inspection of the manufacture of this substance.

WORKMEN'S COMPENSATION ACTS.

The Home Office have recently issued statistics of proceedings during 1901 under the Workmen's Compensation Acts, 1897 and 1900, and the Employers' Liability Act, 1880. In an introductory note it is pointed out that the return leaves untouched the great body of cases of compensation to workmen; the majority of such cases being settled by agreement, no

memorandum is registered under Schedule II. (8) of the Act of 1897, and no official information is therefore available.

The particulars given as to claims made under these Acts in respect of injuries received by persons employed in agriculture show that the number of cases under the Workmen's Compensation Acts dealt with by English and Welsh County Courts in 1901 was nineteen. Of the claims for compensation finally settled within the cognizance of the Courts, the decision in seven cases was in favour of the applicant and in three in favour of the respondent, payments averaging nine shillings weekly being awarded to the successful claimants. In addition, memoranda of six cases which were settled by agreement, and of one which was decided by an arbitrator mutually agreed upon by the parties, were registered in the County Courts.

Under the Employers' Liability Act, six cases classed as agricultural were brought before County Courts. Of these two were decided in favour of the plaintiff, the total damages awarded amounting to £32 10s. In one case judgment was given for the defendant, and three actions were otherwise disposed of.

Only one case under these Acts was dealt with in the Scotch Sheriff Courts during the year, though in another case which was settled by agreement, a memorandum was registered.

LIVE STOCK IN SOUTH AUSTRALIA.

The following Table, taken from the *Board of Trade Journal* for August 14th last, shows the number of each class of live stock in South Australia during the year ended March 31st last, with comparative figures for the preceding year:—

LIVE STOCK.	1900-01.	1901-02.
	No.	No.
Horses	166,790	165,303
Milch cows	75,942	74,995
Other horned cattle	138,819	150,261
Sheep and lambs	5,235,220	5,012,216
Goats	8,945	8,869
Pigs	89,734	88,886
Other animals	2,884	3,951
Poultry of all kinds	1,348,462	1,351,579

It will be noted that five out of the eight classes of live stock mentioned show a decrease as compared with the year 1900-01 The decrease in the number of cows was accompanied by a large falling off in the production of butter, only 4,955,000 lb. being manufactured in 1901-02, as against 5,526,000 lb in the preceding year. On the other hand, the output of cheese, which amounted to 1,053,000 lb., showed a slight advance on the figures for 1900-01.

Roumanian Forests.

The extent of land covered by forests in Roumania amounts to 6,935,000 acres, or about one-sixth the total area of the country. Of this total 2,712,500 acres are owned by the State; 3,732,000 acres by private individuals; and 315,000 acres by public establishments and communes; while the remaining 175,500 acres belong to the Crown domains. The State forests are in good condition, great care being exercised in regard to cutting; but the forests of the peasant proprietors and small holders are said to have been ruined by promiscuous and wholesale cutting. The principal kinds of timber grown are beech, different varieties of oak, pitch pine, and fir; lime, elm, ash and plane are also produced.

[*Foreign Office Report, Annual Series, No.* 2,874.]

Dairying in Washington.

H.M. Consul at Portland, Oregon, reports that there has been a very rapid increase in dairying in all the States in his consular district during the last few years. The farmers of Western Oregon have increased their butter production fully one-third during the year, and Washington has increased in about the same ratio. No less than 62 new creameries and cheese factories were opened during the year, there being now 253 creameries and 37 cheese factories in the latter State. Nearly every farmer who has a fair number of cows has a hand or power cream separator, and most of the farmers do not make butter on the farm, but sell the cream to butter factories. The production of butter and

cheese has now reached a point where the supply is sufficient for home consumption, and an export trade must be established. Quantities are, of course, sent to Alaska, but farmers are looking for trade with Japan, China, the Philippine and Hawaiian Islands. The average price paid by creameries for butter fat was 11d. per lb., and the average price paid by dealers for butter of the highest grade was 11½d. per lb. The natural result of the increase in dairying, pursued as a business, is the rapid improvement in the breeding of farm cattle.

[*Foreign Office Report, Annual Series, No.* 2,858.]

Crude Phosphates and Thomas Phosphate Powder.

The success attending the use of crude phosphates, especially Algerian phosphates, at the experimental stations at Bremen, has given rise in many parts of Germany to the idea that such phosphates can be used as a complete substitute for Thomas phosphate powder. This success has, however, been attained only because of the peculiar nature of the soil—a peat exceptionally rich in humus—at Bremen, and the misapprehensions in this connection have induced the Director of the Experimental Station to publish a warning. In all publications dealing with Algerian phosphates it has been distinctly stated that they can only be used as an equivalent substitute for Thomas phosphate powders on such lands (like the high peat soils after normal chalking) as contain fairly large quantities of free humic acids. The effect of Algerian phosphates on low-lowing peat meadows is so far behind that of Thomas phosphate powder that it cannot be used as a substitute.

[*Deutsche Landwirtschaftliche Presse, March 29th,* 1902.]

Beetroot Cultivation in Italy.

The manufacture of beetroot sugar has been developed to a very considerable extent in North and Central Italy within the last few years. In 1898 only four factories with a production of about 3,830 tons were engaged, but the number rose in 1901 to 33, with an estimated production of about 73,660 tons.

Some beetroot growers are reported to have made more than £12 per acre, but it appears that where large yields are produced the quality of the beet is seriously deficient in saccharine matter as compared with that of France and Germany. H.M. Consul for the district of Lombardy thinks that if the agriculturists do not remedy this defect by improved methods of cultivation, the factories which are already placed at a disadvantage by the larger quantities of raw material which is necessary, will not be able to hold their own against foreign rivals at the present price of the roots.

[*Foreign Office Report, Annual Series, No.* 2,773.]

Artificial Manures for Spain.

A few years ago all the chemical manures that were imported into Spain came from the United Kingdom, but now the greater part comes from Germany, and the quantity imported from the United Kingdom is smaller every year. This rapid decrease may be attributed to the fact that German firms more frequently send travellers to visit the consuming districts. They thus keep in touch with their customers, get to know them and their requirements better, and consequently are in a position to give greater facilities than British manufacturers.

[*Foreign Office Report, Annual Series, No.* 2,780.]

Fertilisers in Italy.

The use of chemical fertilisers continues to extend in Italy, but the production has already been overdone, and it is estimated that the annual production of superphosphates alone has reached nearly 500,000 tons, which exceeds the consumption. A project for forming a syndicate to regulate the production and sale price has been unsuccessful owing to the refusal of a certain number of firms to join. The present state of things is, however, not unfavourable to the consumer, as he is able, owing to competition, to provide himself with fertilisers below cost price.

[*Foreign Office Report, Annual Series, No.* 2,773.]

Agriculture in Corsica.

The acreage under cereal crops in 1900 amounted to nearly 350,000 acres, of which 331,000 were under wheat, 9,000 under barley, 5,000 under rye, and 3,000 under oats, with small quantities of maize and mixed corn. The extent of vine culture has seriously diminished during recent years. In 1882 there were 74,000 acres of vineyards, but the area has since fallen to 25,000 acres. An agricultural school is to be established in the neighbourhood of Ajaccio. The land and buildings will be provided by the Department, and the Government will contribute £1,000 annually towards the maintenance of the school, which will afford accommodation for from 20 to 30 pupils.

[*Foreign Office Report. Annual Series No.* 2784. *Price* 1*d.*]

Warsaw Wool Fair.

The annual wool fair at Warsaw was held this year on June 17th and 18th. Nearly 1,712,000 lb. of wool were offered for sale, as compared with 2,000,000 lb. last year. Disease among sheep in Poland, and a tendency to replace sheep breeding by dairy farming, probably account for part of this deficiency, while the cold and wet spring is also mentioned as having lessened the clip. Most of the wool was bought up by local mills, but buyers from Russia and Silesia were also represented.

[*Board of Trade Journal, July* 10, 1902.]

Berry Industry in Norway.

The Board have received information through the Foreign Office that the berry harvest in Norway is beginning to assume large proportions. The chief centre of this industry is in Odalen, where a large quantity of cranberries (resembling the Scotch rather than the Russian variety) are produced. Great quantities of raspberries are also gathered. The Norwegians are being urged to cultivate their berry gardens on rational principles

in order to increase the profit, and it is stated that this cultivation of berries has made such rapid strides that in two or three years' time the country will probably produce more than it can consume.

The Potato Harvest.

The Board have received information that the potato crops of Holland and Belgium are this season very poor, both in quantity and quality, owing to the heavy rainfall, and the quantity available for export is likely to be considerably less than in former years. It is believed that one result of the comparative failure of this season's crops in the above countries will be to improve prices on British markets. In Great Britain, also, the numerous reports of the prevalence of potato disease render it probable that good keeping qualities will be scarce.

HARVEST AND CROP REPORTS.

The Wheat Harvest of India, 1901-2.

The final general memorandum issued by the Statistical Department of the Government of India shows that, owing to the unfavourable season, the yield of the wheat crop of 1901-1902 was generally below the average. The monsoon of 1901 terminated early, and the winter rains, on which the successful cultivation of wheat is so dependent, were an almost complete failure, except in the United Provinces of Agra and Oudh, where some rain in December and January, combined with liberal irrigation, had a beneficial effect on the crop. The total yield in these provinces was 18·5 per cent. above the average of the preceding ten years; the Central Provinces, where the production was 7 per cent. above the average, being the only other district in which the harvest was at all satisfactory.

In the Punjab and the North-West Frontier Province, whence so much of the wheat exported from India is drawn, the conditions of the season were bad. The results in the Punjab show a deficiency of nearly 200,000 tons as compared with the average yearly yield, while the total yield in the North-West Frontier Province is estimated at less than 159,300 tons, the crop being only 67 per cent. of the normal. In Bengal the crop was affected by the drought, and the yield was 21·1 per cent. less than the average. The failure was very great in Bombay, Berar, the Nizam's Territory, and Rajputana, where the injury done by the drought was completed by the depredations of rats and insects. On the whole, the total yield in India is estimated at slightly more than 6 million tons, or 7·9 per cent. short of the average of the preceding decennial period.

Owing to the vicissitudes of the seasonal conditions, the

export trade in wheat from India shows great fluctuations from year to year. Only in one year of the last seven has there been a trade approximating to one million tons. The exportation in 1901–2 amounted to 366,091 tons, as compared with the remarkably small total of 2,500 tons returned for 1900–1.

The following Table shows the estimated acreage and yield of wheat in the various provinces :—

Province.	Area.		Production.	
	1901-02.	1900-01.	1901-02.	1900-01.
	Acres.	Acres.	Tons.	Tons.
Punjab	7,227,100	7,717,800	1,846,300	2,636,700
North-West Frontier Province	796,500	—	159,279	—
United Provinces of A ra and Oudh ...	6,479,720	6,790,440	2,401,940	2,384,605
Bengal	1,388,200	1,498,700	391,000	472,600
Central Provinces ...	2,590,209	2,055,736	561,574	440,909
Bomba	1,333,816	1,433,810	168,971	298,479
Sind	495,613	479,487	102,132	123,160
Berar	280,085	243,554	6,180	5,093
Nizam's Territory ...	712,157	748,163	13,184	15,068
Rajputana (*a*)	535,241	713,290	103,835	170,682
Central India (*a*) ...	1,451,633	1,238,317	254,331	218,224
Mysore...	3,714	2,556	256	197
... ...	23,293,988	(*b*) 22,921,853	6,008,982	(*b*) 6,765,717

(*a*) Incomplete. (*b*) Excluding North-West Frontier Province.

CROPS IN THE UNITED STATES.

Preliminary returns as to the wheat crop of the United States indicate that there was a reduction of about 2,511,000 acres, or 12·8 per cent., in the area sown with spring wheat, as compared with last year's sowings. Of winter wheat the yield is put at about 380,000,000 bushels, or 13·8 bushels per acre.

The Times of the 11th inst. quotes the United States Department of Agriculture's September report to the effect that the condition of maize has deteriorated a little during August, though it is better than the average. The acreage under this crop was estimated in an earlier return to be about 3,520,000

acres, or 3·9 per cent. more than that harvested last year. These figures would indicate an area planted in 1902 of about 94,870,000 acres. The crop is, however, very late.

The average condition of oats when harvested is reported to be considerably above the mean, and an exceptionally large crop is expected, but the quality is thought to be deficient. Barley and rye also show improvement, both as compared with last year and with the ten years' average.

THE RUSSIAN HARVEST OF 1902.

Information received through the Foreign Office indicates that the weather experienced in most parts of European Russia during the early part of this year was very favourable to the growth of crops. At the end of June and during the first fortnight of July, however, great heat and drought prevailed in the basin of the Volga and in the south-eastern provinces, while, at the same time, the western districts of the country suffered from excessive cold and rain. Owing to this bad weather the harvest was delayed for two or three weeks, and in most of the western provinces and in the industrial region of the central provinces harvest operations were not commenced until August.

The cereal harvest was expected, according to information collected in July and August, to give, on the whole, satisfactory results this season. With the exception of a few districts, the yield of winter wheat was above the average, and it was anticipated that the spring-sown crop would also yield well. The production of rye was expected to be larger than usual, but the reports as to the prospects of barley and oats were not quite so satisfactory. On the other hand, both buckwheat and millet are stated to have been yielding excellent crops.

CROPS IN HUNGARY.

The official report on the condition of crops in Hungary on August 10th last indicates that the grain harvest this year promises to be much better than in 1901. The area under

wheat is about 8,105,000 acres, which are expected to produce 20,598,000 quarters. This estimate of production is based upon trial threshings, which show also that the quality is generally good. The quality of rye is also stated to be good. Of this cereal (including mixed corn) there were about 2,793,000 acres, estimated to produce 6,242,000 quarters. The area under barley is given as 2,444,000 acres, producing 5,856,000 quarters, generally of good quality, though there are local exceptions. The area under oats is 2,396,000 acres, and the production is estimated at 5,604,000 quarters.

CROPS IN GERMANY.

The August reports upon the crops in Germany indicate that the harvest of practically all farm produce this year may be expected to be about the average. The weather had mostly, however, been cold and wet, so that the ripening of the grain had been considerably delayed, and the harvest was generally late.

Wheat was, on the whole, somewhat better than rye, both being best in Bavaria. Only in a few districts of South Germany was the harvest finished; elsewhere it was in general progress, though the wet weather was in many places preventing the corn from being got in. Barley cutting was beginning, but the quality of this grain had suffered considerably. Oats had been the least affected by the rain; they were, however, mostly still green.

The condition of potatoes was very variable, some localities sending good reports and others bad, but potato-disease was generally feared. Clover and lucerne had been greatly retarded by the cold. They, as well as grass, were better in the south than in the north.

CROPS IN FRANCE.

According to the reports published in the *Journal Officiel* of July 19th, 1902, there was general deterioration of the crops in France between May 15th and July 1st of this year.

The condition of winter wheat crops on July 1st was stated to be "very good" in 1 department, "good" in 44, "fairly good" in 36, "fair" in 5, and "indifferent" in 1 department. The condition of spring wheat was reported "very good" in 1 case, "good" in 26, "fairly good" in 17, "fair" in 3 departments, and "indifferent" in 1 department; while in 39 departments no spring wheat was grown.

Winter and spring oats were reported to be "very good" in 5 and 2 departments respectively; "good" in 29 and 28; "fairly good" in 28 and 41, and "fair" in 2 and 9. No winter oats were sown in 22, and no spring oats in 7 departments.

The condition of winter barley was estimated to be "very good" or "good" in 31 departments, "fairly good" or "fair" in 27, and "bad" in 1. The corresponding figures for the spring barley crop were 29, 44, and 1 department, respectively, while in 1 department the crop was "indifferent." No winter oats are grown in 28 and no spring oats in 12 departments.

CROPS IN POLAND.

According to information received through the Foreign Office from His Majesty's Consul at Warsaw, the harvest in Poland this year is, generally speaking, expected to be satisfactory, notwithstanding the unfavourable weather in the early part of the season. Thus, good rye and wheat crops are expected; while oats and barley are expected to be about average. It is, however, stated that the harvesting of winter grains is about three weeks late, and this will, in due course, delay the getting in of the spring cereals. In the north of Poland, beet and potatoes are disappointing, the crops in certain districts being a complete failure; but in the remaining parts of Poland both of these crops should give a fairly good yield, and in Lithuania also the potato crop may be expected to be satisfactory.

PARLIAMENTARY PUBLICATIONS.

Board of Agriculture.—Annual Report of Proceedings under the Sale of Food and Drugs Acts, Merchandise Marks Acts, &c. [*Cd.* 1,215.] *Price 2d.*

This Report contains an account of the work carried on by the Intelligence Division of the Board during the year 1901.

The Board's Inspectors interviewed during the past year the officials of 274 Local Authorities in Great Britain with regard to the administration of the Sale of Food and Drugs Acts. The Inspectors also visited the premises of 1,150 manufacturers and wholesale dealers in margarine and margarine cheese, and examined the registers of sales kept in accordance with the requirements of Section 7 of the Act of 1899. During the year further notifications were received by the Board from 105 Local Authorities of the registration of 494 such premises under Section 7 of the Act. The total number of registrations in Great Britain under this Section up to December 31st, 1901, was 2,657.

In pursuance of the powers conferred upon them by Section 4 of the Act of 1899, the Board issued on August 5th, 1901, Regulations relating to the sale of milk in Great Britain, which came into operation on September 1st. A circular was subsequently issued to Local Authorities explaining the principal features of these Regulations, and also suggesting the adoption of uniform procedure in the collection and retention of samples procured under the provisions of the Sale of Food and Drugs Acts.

Towards the close of the past year the Board were asked by the Bacon Curers' Association of Great Britain and Ireland to institute proceedings in a number of cases of alleged sales of hams in London and certain provincial towns in contravention

of the Merchandise Marks Acts. Arrangements were accordingly made with the Solicitor of the Treasury for the prosecution of certain of the cases which were supported by evidence sufficient to afford reasonable probability of a conviction. These cases were still pending at the end of the year.

The returns received under the Fertilisers and Feeding Stuffs Act, 1893, show that in 1901 analyses were made in 60 counties and boroughs in Great Britain, as against 58 in 1900. The total number of samples analysed, which had been practically stationary in the three preceding years, increased in 1901 to 1,068, or 94 more than in 1900. Both fertilisers and feeding-stuffs participated in this increase. No samples were submitted for analysis last year in 20 English, 3 Welsh, and 14 Scotch counties.

The Report also contains an account of the measures adopted in the autumn of 1901 to exterminate the Colorado beetle, with which certain allotments at Tilbury were found to be infested.

Information interesting to agriculturists was disseminated by means of special reports, the *Journal*, and leaflets. The total number of leaflets issued in 1901 was approximately 587,400, and the number of separate applications for copies in the year was about 4,500.

Report on the Progress of the Ordnance Survey to March 31*st*, 1902. [*Cd.* 1243.] *Price* 4*s*. 4*d*.

The revision of the Cadastral Survey of England and Wales on the $\frac{1}{2500}$ scale, which was begun in 1894, has now been completed for the following counties, viz.: Anglesey, Bedford, Berks, Bucks, Cambridge, Carnarvon, Chester, Cumberland, Denbigh, Derby, Dorset, Durham, Essex, Flint, Glamorgan, Hants, Hertford, Hunts, Kent, London, Merioneth, Middlesex, Monmouth, Montgomery, Northampton, Northumberland, Notts, Oxford, Salop, Stafford, Surrey, Sussex, Westmorland, Wilts. The revision is still in progress for the counties of Gloucester, Hereford, Leicester, Radnor, Somerset, Stafford, Suffolk, Warwick, and Worcester. Maps on the scale of 6 inches to a mile, reduced,

as a rule, from the $\frac{1}{2500}$ scale, are published as the revision proceeds; but in uncultivated districts, the revision is made direct on the original 6-inch maps. With regard to the maps on the 1-inch scale, the whole of England and Wales has been revised on the ground since 1893, and the maps have been engraved and published. The issue of this map in colour is being proceeded with; it is nearly completed for the South of England and Wales, and has been commenced in the North of England, and the second revision of this map has been commenced. A general outline map and a county or district outline map with main roads coloured, on the scale of 4 miles to an inch, have now been published for the whole of England and Wales. A general hill-shaded coloured map on the same scale is in course of preparation and publication has commenced.

The revision of the Cadastral Survey of Scotland on the $\frac{1}{2500}$ scale was begun in 1894, and has been completed for Aberdeen, Argyll, Ayr, Berwick, Bute, Clackmannan, Dumbarton, Dumfries, Forfar, Lanark, Linlithgow, Orkney, Peebles, Perth, Renfrew, Roxburgh, Selkirk, Shetland, and Stirling, and is in progress in Banff, Kincardine, Inverness, Ross and Cromarty. The publication of the revised 1-inch maps of Scotland, with the hills printed in brown, has been completed, while the second revision of the map has been commenced. An advance edition of the map, on the scale of 4 miles to an inch, has been published in outline by photozincography. The publication of the engraved edition is in progress, and a coloured edition, with hills in brown, is also being published.

With regard to the re-survey of Ireland, the Director-General states in the Report that 12,516 square miles on the $\frac{1}{2500}$ scale have been surveyed, of which 8,676 square miles have been published. The work has been delayed by the extreme closeness of the detail, but the staff has been increased, and two divisions have been transferred from Great Britain to Ireland.

Since April 1st last year the publication and sale of geological maps has been undertaken by the Ordnance Survey. The net value of the Ordnance Survey and Geological Survey maps sold in 1901–1902 was £23,171, while the value of maps presented to public departments, &c., amounted to £13,937.

Ireland: Report of Proceedings under the Diseases of Animals Acts for the year 1901. [*Cd.* 1126.] *Price* 4½*d.*

During the year 1901 Ireland again enjoyed complete immunity from pleuro-pneumonia and foot-and-mouth disease. As in each of the three preceding years, only two outbreaks of anthrax occurred, while the number of outbreaks of glanders was 5, as against 10 reported in 1900.

The measures which are being taken for stamping out rabies seem to have met with considerable success, for only two cases were reported during the year, as compared with 15 in 1900, 92 in 1899, and 132 in 1898.

The number of outbreaks of sheep-scab was 545, exactly the same total as that for 1900. The outbreaks of swine fever in 1901 numbered 220, or 13 less than in 1900, but it should be noted that the figures for the latter year showed a marked falling off from the totals recorded for previous years.

Outbreaks of parasitic mange reached a total of 174, or 66 in excess of the figures for 1900. It is not, however, believed that this increase is due to any real extension of the disease, but merely to the fact that more cases have been brought to light.

Judicial Statistics, England and Wales, 1900, *Part I.* [*Cd.* 953.] *Price* 1*s.* 6*d.*

This publication contains statistics relating to criminal proceedings for 1900. The cases dealt with in Courts of Summary Jurisdiction during the year included 3,545 prosecutions for offences against the Sale of Food and Drugs Acts, as compared with 3,527 cases in 1899. Fines were imposed in 2,808 instances, while in one case a sentence of imprisonment was inflicted. Appeals were made to Quarter Sessions against five of these convictions, but in each case the judgment was confirmed, subject, however, in one instance, to a special case being taken. The number of cases of this character tried in London, viz., 1,079, was larger than that in any other county, Lancashire coming next with 356, and then Yorks, West Riding, with 215 cases.

Prosecutions were also instituted against 1,508 persons in respect of offences against the Diseases of Animals Acts, of whom 1,194 were fined. The number of proceedings instituted in regard to the last class of offences was smaller than that recorded for any year since 1893, the number being less than one-half that returned for 1899.

Technical Education (*Application of Funds by Local Authorities*). [*H.C.* 225.] *Price* 1*s.* 1*d.*

This return shows the amount spent on technical education by local authorities in England and Wales—with the exception of eleven which have made no return—during the year 1900-1. Particulars are also given of the amounts raised by loan on the security of the local rate under the Technical Instruction Act 1889—mainly for the erection of science, art and technical schools.

The total amount of the residue grant received under the Local Taxation (Customs and Excise) Act, by the councils of counties and county boroughs in England (excepting the county of Monmouth) was £924,360, of which £863,847 was appropriated to educational purposes, and £60,513 to the relief of rates. Of the 49 county councils, 40 applied the whole of the residue to technical education; and of the councils of the 62 county boroughs, 56 devoted the whole to the same purpose. Many counties, boroughs and urban districts also devoted money raised by rate to technical education.

The total amount expended on technical education during the year was £1,006,630 16s.

The total amount of residue grant paid to the 13 county councils and the councils of the 3 county boroughs in Wales and Monmouth was £44,358. These local authorities devoted the whole of it to intermediate and technical education, and the councils of 9 counties, 3 county boroughs, 5 boroughs and 9 urban districts made grants out of the rates under the Technical Instruction Acts. The total amount expended on technical education under the Technical Instruction Acts during the year was £44,791.

Local Authorities in Scotland (Technical Education), 1900-1.
[*H.C.* 182.] *Price 7d.*

This return indicates that the total amount of the residue grant paid to county councils, burgh councils, and Commissioners of police burghs, in Scotland, in respect of the year 1899–1900 was £87,600, of which £62,447 was allocated to purposes of technical education, and £25,153 to the relief of rates. Out of the 33 county councils, 26 applied the whole of the grant to technical education, and 4 a part of it, while 3 applied the grant wholly to the relief of rates. Of the 206 burghs and police burghs, 53 applied the whole and 73 a part of the residue grant to technical education ; 80 applied the whole to relief of rates.

No amount was applied to the building or maintenance of science and art schools, art galleries, or museums out of the local rate under the Public Libraries Acts. The total amount available for purposes of technical education during the year 1900–1901, including balance in hand, contributions under section 2 (5) c of the Education and Local Taxation Account (Scotland) Act, 1892, bank interest, &c., was £81,959, and the total amount expended was £61,700, of which £16,073 was handed over to Secondary Education Committees.

LIVE WEIGHT PRICES OF CATTLE.

The returns received from the twenty-one places in Great Britain scheduled under the Markets and Fairs (Weighing of Cattle) Act, 1891, show that the number of cattle entering the markets in the second quarter of 1902 was 336,829, as compared with 300,579 head in the corresponding period of last year. There was a substantial increase in the number of pigs exposed at these places of sale, and the sheep were also rather more numerous.

Animals.	2nd Quarter, 1902.	2nd Quarter, 1901.
CATTLE:	*No.*	*No.*
Entering markets	336,829	300,579
Weighed	44,348	36,384
Prices returned	36,332	32,848
Prices returned with quality distinguished	29,158	26,535
SHEEP:		
Entering markets	1,187,169	1,145,699
Weighed	13,018	14,396
Prices returned with quality distinguished	9,240	10,591
SWINE:		
Entering markets	100,108	88,238
Weighed	840	652
Prices returned with quality distinguished	840	646

The number of cattle weighed was 13·2 per cent. of the total, compared with 12·1 per cent. last year, and prices were available in 10·8 per cent. of the total number of cattle, a slight increase on any previous quarter. The use made of the weigh-

bridges in the case of live stock, other than cattle, remains insignificant.

At York, Bristol, and Birmingham nearly 57,000 head of cattle, besides sheep and pigs, passed through the markets without the weighing machine being, so far as is known, resorted to in any single instance, while at Lincoln, Norwich, and Ashford the numbers weighed were so small as to be negligable. The average prices at the thirteen markets from which sufficient data for the calculation of an average for fat cattle were forthcoming, were as follows:—

PLACES.	INFERIOR or Third Quality.			GOOD or Second Quality.			PRIME or First Quality.		
	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.
		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.
Carlisle ...	188	3 5¼	27 6	234	3 10½	31 0	1,520	4 6¼	36 2
Leicester ...	3	3 7¼	28 10	32	4 4¼	34 10	75	4 11	39 4
Leeds... ...	—	—	—	63	3 9¼	30 2	456	4 8	37 4
Liverpool ...	190	3 7½	29 0	126	4 3¼	34 2	693	5 0¾	40 6
London ...	5	3 9½	30 4	234	4 10¾	39 2	1,253	5 3½	42 4
Newcastle ...	—	—	—	57	4 6¾	36 6	1,032	5 2¾	41 10
Shrewsbury..	101	3 10¼	30 10	213	4 4¾	35 2	275	4 10¾	39 2
Aberdeen ...	1,495	3 5¾	27 10	1,377	4 6	36 0	3,271	4 10¾	39 2
Dundee ...	645	3 6	28 0	1,513	4 7½	37 0	837	5 1	40 8
Edinburgh...	—	—	—	3,063	4 11¼	39 6	249	5 2	41 4
Falkirk ...	53	4 2	33 4	216	4 7¼	36 10	420	4 11½	39 8
Glasgow ...	210	4 7¼	36 10	584	4 11	39 4	2,770	5 0½	40 4
Perth	46	3 10½	31 0	329	4 6	36 0	1,457	4 11	39 4

This statement shows a considerable rise in prices as compared with the first quarter of the present year, but an indication of the general course of prices in Great Britain may be more conveniently obtained from the following table, which is made up from the returns received month by month up to July last from the thirteen markets above mentioned:—

Months.	Good, or Second Quality.				Prime, or First Quality.			
	1902.		1901.		1902.		1901.	
	per cwt.		per cwt.		per cwt.		per cwt.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
January...	34	6	34	8	36	2	36	2
February	34	6	34	6	36	4	35	10
March	34	6	34	2	36	4	36	0
April	35	10	34	2	37	8	36	0
May	37	4	34	2	39	8	36	0
June	40	4	34	8	42	8	36	4
July	39		34	8	41	4	36	4

The prices of both second and first quality meat for the first three months of 1902 did not exhibit much variation from those prevailing at the corresponding dates last year, but in April there was a rise of 1s. 4d. per cwt. in both qualities. In May a further rise took place, while in June a sharp increase of 3s. per cwt. was shown, so that second quality beef cattle which fetched 34s. 6d. in March were worth 40s. 4d. per cwt. in June, while prime animals increased in value from 36s. 4d. to 42s. 8d. per cwt. In July, however, there appears to have been some falling off in values.

The sale of fat cattle at an agreed rate per stone or per cwt. was reported from eight markets during the three months ending June 30th last, the number of animals thus sold being 3,120, but about two-thirds of the whole number of transactions of this character took place at Glasgow.

A number of store cattle were also reported to have been weighed during the same period, and prices were furnished in respect of 3,679 head, the majority of which were returned from Shrewsbury. It may be noted that whereas at this market in the first quarter of the current year second quality store cattle fetched 30s. 6d. per cwt. and first quality 33s. 6d. per cwt., in the second quarter the prices of these grades rose to 35s. 6d. and 39s. 6d. per cwt. respectively. A few stores were also sold by live weight at Leicester and Edinburgh.

The Table giving the usual particulars for the quarter is appended :—

CATTLE, SHEEP, AND SWINE, *entering the Markets and Marts of the undermentioned Places, with the Number Weighed, as returned by the Market Authorities in the* SECOND QUARTER *of* **1902**, *under the Markets and Fairs (Weighing of Cattle) Act*, 1891 (54 *and* 55 *Vict. c.* 70).

PLACES.	Cattle.			Sheep.			Swine.		
	Total Number entering the Markets or Marts.	Number Weighed.	Number Weigh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.
ENGLAND.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Ashford	2,227	28	—	21,444	—	—	4,685	—	—
Birmingham... ...	7,763	—	—	19,733	—	—	46,616	—	—
Bristol	14,503	—	—	34,766	—	—	2	—	—
Carlisle	19,251	1,942	1,942	51,531	—	—	3,261	—	—
Leicester	20,260	255	170	19,976	—	—	1,595	—	—
Leeds	8,560	519	519	37,710	1,031	1,031	2	—	—
Lincoln	3,372	—	—	18,457	—	—	3,080	24	24
Liverpool	10,923	1,009	1,009	111,871	1,435	1,435	109	21	21
London	17,360	3,296	1,492	143,510	3,587	—	130	—	—
Newcastle-upon-Tyne	23,955	1,089	1,089	83,724	—	—	7,961	725	725
Norwich	29,926	62	62	46,839	—	—	5,751	—	—
Salford	23,152	761	—	168,747	—	—	771	—	—
Shrewsbury	18,420	7,630	4,103	18,154	—	—	9,178	—	—
Wakefield	17,336	1,113	132	54,798	—	—	4,137	—	—
York	34,431	—	—	24,916	—	—	1,363	—	—
SCOTLAND.									
Aberdeen	12,583	6,149	6,149	76,541	5,626	5,626	3,747	—	—
Dundee	5,327	2,995	2,995	7,586	745	745	817	—	—
Edinburgh	20,200	7,089	*3,411	88,281	80	20	2,448	—	—
Falkirk	3,637	689	689	2,358	—	—	28	—	—
Glasgow	20,404	4,394	3,564	67,495	220	89	1,513	—	—
Perth...	23,239	5,328	*1,832	88,732	294	294	2,914	70	70
TOTAL for ENGLAND	251,439	17,704	10,518	856,176	6,053	2,466	88,641	770	770
TOTAL for SCOTLAND	85,390	26,644	*18,640	330,993	6,965	6,774	11,467	70	70
Total	336,829	44,348	*29,158	1,187,169	13,018	9,240	100,108	840	840

* Prices for 3,678 cattle in addition to the above were quoted from Edinburgh and for 3,496 cattle from Perth, but without distinguishing the quality.

PRICES OF MEAT, CORN, AND DAIRY PRODUCE.

AVERAGE PRICES of DEAD MEAT, per 8 lbs., at the LONDON CENTRAL MEAT MARKET, during the Second Quarter of 1902, and during the Months of June, July, and August, 1902.

(*Compiled from the prices quoted weekly in the "Meat Trades' Journal."*)

DESCRIPTION.	2ND QUARTER.	JUNE.	JULY.	AUGUST.
	s. d. s. d.	*s. d. s. d.*	*s. d. s. d.*	*s. d. s. d.*
BEEF :—				
Scotch, short sides	4 9 to 5 0	5 4 to 5 7	5 4 to 5 7	5 0 to 5 3
,, long sides	4 6 ,, 4 8	4 10 ,, 5 1	4 9 ,, 4 11	4 6 ,, 4 8
English...	4 4 ,, 4 6	4 7 ,, 4 10	4 7 ,, 4 10	4 2 ,, 4 5
Cows and Bulls	2 4 ,, 3 7	2 4 ,, 3 9	2 5 ,, 3 9	2 2 ,, 3 6
American, Birkenhead killed...	4 2 ,, 4 4	4 4 ,, 4 6	4 4 ,, 4 6	3 11 ,, 4 2
,, Deptford killed ...	4 3 ,, 4 5	4 4 ,, 4 8	4 5 ,, 4 9	4 1 ,, 4 5
American, Refrig. hind-quarters	4 5 ,, 4 8	4 5 ,, 4 9	4 8 ,, 5 0	4 4 ,, 4 9
,, ,, fore-quarters	3 1 ,, 3 4	3 0 ,, 3 2	3 0 ,, 3 2	3 2 ,, 3 5
Australian, Frozen, hind-quarters	2 9 ,, 3 0	—	3 6 ,, 3 7	3 6 ,, 3 7
,, ,, fore-quarters	2 7 ,, —	—	2 9 ,, —	2 7 ,, 2 8
New Zealand, ,, hind-quarters	3 4 ,, —	3 2 ,, —	3 6 ,, 3 7	3 7 ,, 3 8
,, ,, fore-quarters	2 10 ,, —	2 8 ,, —	2 5 ,, 2 6	2 10 ,, 2 11
River Plate, ,, hind-quarters	3 1 ,, —	2 11 ,, —	3 5 ,, —	3 6 ,, —
,, ,, fore quarters	2 8 ,, 2 9	2 7 ,, —	2 5 ,, —	2 10 ,, —
MUTTON :—				
Scotch	4 9 ,, 5 2	5 1 ,, 5 7	5 0 ,, 5 5	4 6 ,, 4 10
English	4 7 ,, 5 0	4 10 ,, 5 3	4 8 ,, 5 2	4 3 ,, 4 8
Ewes	3 7 ,, 4 0	3 6 ,, 4 0	3 5 ,, 3 10	3 2 ,, 3 7
Continental	4 3 ,, 4 6	4 5 ,, 4 9	4 3 ,, 4 9	3 11 ,, 4 4
New Zealand, Frozen... ...	2 4 ,, 2 10	2 4 ,, 2 10	2 0 ,, 2 8	2 4 ,, 2 9
Australian, Frozen	2 4 ,, 2 5	2 5 ,, —	2 2 ,, 2 3	2 4 ,, —
River Plate, Frozen	2 5 ,, 2 6	2 6 ,, 2 7	2 3 ,, 2 4	2 3 ,, 2 4
LAMB :—				
English	5 8 ,, 6 11	5 1 ,, 6 3	4 11 ,, 5 9	4 6 ,, 5 4
New Zealand, Frozen... ...	3 3 ,, 3 6	3 0 ,, 3 2	2 8 ,, 3 0	3 1 ,, 3 4
VEAL :—				
Best	4 6 ,, 4 11	4 4 ,, 4 10	4 2 ,, 4 7	4 4 ,, 4 9
Secondary and middling ...	3 11 ,, 4 5	3 9 ,, 4 3	3 6 ,, 4 1	3 6 ,, 4 2
PORK :—				
English, best	4 5 ,, 4 9	4 2 ,, 4 7	4 1 ,, 4 5	4 2 ,, 4 6
,, seconds and thirds ...	3 7 ,, 4 1	3 8 ,, 4 1	3 7 ,, 3 11	3 7 ,, 3 11

AVERAGE WHOLESALE PRICES of CATTLE and SHEEP, per 8 lbs., sinking the offal, at the METROPOLITAN CATTLE MARKET, during the under-mentioned Quarters of 1901 and 1902.

PERIOD.	CATTLE.			SHEEP.		
	Inferior.	Second.	First.	Inferior.	Second.	First.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
2nd Quarter, 1901	2 4	3 11	4 6	3 3	4 9	5 7
3rd Quarter, ,,	2 4	4 0	4 7	3 2	4 9	5 7
4th Quarter, ,,	2 5	4 0	4 9	3 2	4 10	5 7
1st Quarter, 1902	2 7	3 11	4 8	3 6	4 10	5 6
2nd Quarter, ,,	3 3	4 6	5 1	3 10	5 2	6 0

AVERAGE WHOLESALE PRICES of BEEF and MUTTON, per 8 lbs., by the Carcase, at LIVERPOOL and GLASGOW, during the under-mentioned Quarters of 1901 and 1902.

PERIOD.	LIVERPOOL.*		GLASGOW.†	
	BEEF.	MUTTON.	BEEF.	MUTTON.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
2nd Quarter, 1901	2 10 to 3 8	4 8 to 5 8	3 4 to 3 10	4 2 to 5 2
3rd Quarter, ,,	3 0 ,, 3 11	3 8 ,, 5 0	3 0 ,, 3 10	3 8 ,, 4 8
4th Quarter, ,,	2 4 ,, 4 0	3 4 ,, 4 10	3 0 ,, 3 10	3 0 ,, 4 4
1st Quarter, 1902	2 6 ,, 4 0	3 4 ,, 5 4	4 4 ,, 4 10	5 0 ,, 5 10
2nd Quarter, ,,	3 4 ,, 4 8	3 6 ,, 5 6	4 4 ,, 5 8	4 4 ,, 6 8

* Compiled from information furnished by the Medical Officer of Health, Liverpool. The prices quoted are for Carcases of Animals *slaughtered at the Liverpool Abattoir*, and do not apply to Imported Meat.

† Compiled from information furnished by the Principal of the Veterinary College, Glasgow.

BERLIN MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Dead Weight) in the BERLIN CATTLE MARKET in the under-mentioned Months of 1902.

MONTHS.	OXEN.	SHEEP.	SWINE.
	Per Cwt.	Per Cwt.	Per Cwt.
1902.	*s. d.*	*s. d.*	*s. d.*
May	58 11	58 10	58 8
June	60 1	63 8	56 11
July	...	...	...

NOTE.—The above prices are compiled from the Wholesale Prices quoted in the *Monatliche Nachweise über den Auswärtigen Handel des deutschen Zollgebiets.* The prices for swine are live weight prices with 20 per cent. tare.

PARIS MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Medium Quality, Dead Weight), per cwt., in the PARIS CATTLE MARKET in the under-mentioned Months of 1902.

MONTHS.	OXEN.	CALVES.	SHEEP.	PIGS.
	Per Cwt.	Per Cwt.	Per Cwt.	Per Cwt.
1902.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
June	51 9	60 3	74 11	59 6
July	54 0	52 11	76 9	61 7
August	54 0	56 0	72 10	62 6

NOTE.—The above prices have been compiled from the weekly returns published in the *Journal d' Agriculture Pratique.*

CHICAGO.

AVERAGE PRICES of CATTLE at CHICAGO per cwt. (Live Weight) in the under-mentioned Months of 1902.

MONTH.	Good Dressed Beef and Shipping Steers.					Export Cattle.					Extra Prime Cattle.				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.
June	30	3	to	33	2	30	8	to	35	6	35	6	to	37	11
July	29	9	,,	32	1	30	0	,,	36	5	36	10	,,	40	7
August	28	10	,,	33	2	33	6	,,	38	0	38	6	,,	41	8

Compiled from the Live Stock Reports issued by Messrs. Clay, Robinson and Co., of the Union Stock Yards, Chicago, Illinois.

AVERAGE VALUES, per cwt., of various Kinds of DEAD MEAT Imported into the United Kingdom from FOREIGN COUNTRIES and BRITISH POSSESSIONS in the under mentioned Quarters of 1901 and 1902.

(Computed from the Trade and Navigation Accounts.)

PERIOD.	BEEF.				MUTTON.		PORK.				BACON.		HAMS.	
	Fresh.		Salted.		Fresh.		Fresh.		Salted.					
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
2nd Quarter, 1901 ...	39	5	25	10	36	6	43	8	25	7	47	3	47	7
3rd Quarter, ,, ...	39	4	26	3	37	2	43	5	24	4	46	9	49	11
4th Quarter, ,, ..	38	9	27	1	34	11	43	4	27	7	49	3	50	2
1st Quarter, 1902 ...	40	3	28	8	35	1	43	3	31	6	47	8	48	3
2nd Quarter, ,, ...	43	6	31	4	38	1	44	11	28	10	51	3	50	0

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels,* computed from the Weekly Averages of Corn Returns from the Returning Markets of ENGLAND AND WALES, pursuant to the Corn Returns Act, 1882, together with the QUANTITIES returned as sold at such Markets, in the under-noted periods of the Years 1902, 1901, and 1900.

QUARTER ENDED	PRICES.			QUANTITIES.		
	1902.	1901.	1900.	1902.	1901.	1900.
Wheat.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	27 3	26 3	25 11	826,065	744,018	868,378
Midsummer ...	29 10	27 1	25 9	444,639	547,737	854,497
Michaelmas ...	—	26 11	28 7	—	535,109	511,347
Christmas ...	—	26 7	27 4	—	778,686	689,261
Barley.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	26 8	25 3	25 1	669,250	844,616	888,949
Midsummer ...	25 6	24 9	24 3	40,875	53,408	93,157
Michaelmas ...	—	24 0	24 5	—	236,164	143,552
Christmas ...	—	26 8	25 11	—	2,235,441	2,065,135
Oats.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	20 3	17 6	16 7	239,048	236,316	246,949
Midsummer ...	22 1	19 3	18 2	88,274	81,172	110,163
Michaelmas ...	—	18 7	18 7	—	131,023	116,880
Christmas ...	—	18 4	17 0	—	265,703	237,791

* Section 8 of the Corn Returns Act, 1882, provides that where returns of purchases of British Corn are made to the local inspector of Corn Returns in any other measure than the imperial bushel or by weight or by a weighed measure, that officer shall convert such returns into the imperial bushel, and in the case of weight or weighed measure the conversion is to be made at the rate of 60 imperial pounds for every bushel of wheat, 50 imperial pounds for every bushel of barley, and 39 imperial pounds for every bushel of oats.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1902, and in the corresponding Weeks in 1901 and 1900.

Weeks ended (*in* 1902).	Wheat.			Barley.			Oats.		
	1902.	1901.	1900.	1902.	1901.	1900.	1902.	1901.	1900.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Jan. 4 ...	27 7	26 5	25 9	26 7	25 4	25 7	19 10	17 2	16 2
,, 11 ...	27 8	26 7	25 11	26 7	25 6	25 5	20 0	17 3	16 3
,, 18 ...	27 8	26 11	26 0	26 11	25 9	25 8	20 0	17 3	16 2
,, 25 ...	27 7	26 10	25 10	26 7	25 6	25 9	20 3	17 6	16 4
Feb. 1 ...	27 4	26 7	25 8	26 7	25 7	25 4	20 2	17 8	16 6
,, 8 ...	27 2	26 8	25 10	26 9	25 7	25 3	20 3	17 7	16 5
,, 15 ...	26 11	26 4	26 1	27 5	25 4	24 11	20 3	17 7	16 8
,, 22 ...	27 1	26 1	26 3	26 11	25 0	25 1	20 4	17 7	16 9
Mar. 1 ...	27 1	25 11	26 4	26 8	25 0	24 6	20 5	17 9	16 10
,, 8 ...	27 0	25 9	25 11	26 8	25 4	24 8	20 5	17 7	16 11
,, 15 ...	27 1	25 9	25 10	26 6	25 1	24 6	20 6	17 7	16 11
,, 22 ...	27 1	25 8	25 11	26 4	24 11	25 0	20 6	17 9	17 1
,, 29 ...	27 2	26 0	25 10	27 2	24 9	24 11	20 7	18 0	17 2
Apl. 5 ...	27 3	26 3	25 10	26 5	25 3	24 10	20 6	18 0	17 2
,, 12 ...	27 5	26 5	25 11	26 7	26 0	24 5	21 0	18 1	17 8
,, 19 ...	27 7	26 8	26 0	27 1	25 7	24 9	21 1	18 8	17 3
,, 26 ...	28 9	26 8	26 0	26 5	25 8	25 2	21 6	18 8	17 11
May 3 ...	29 9	26 9	25 11	27 5	26 4	25 3	21 10	19 1	18 0
,, 10 ...	30 9	27 3	25 11	26 10	26 2	24 10	22 6	19 1	17 11
,, 17 ...	31 1	27 7	25 7	25 3	24 2	24 5	22 5	19 4	18 5
,, 24 ...	31 6	27 7	25 5	25 4	24 1	23 11	22 6	19 8	18 2
,, 31 ...	31 6	27 7	25 5	25 1	23 8	24 4	22 10	19 9	18 6
June 7 ...	31 3	27 6	25 3	24 3	22 9	23 8	22 11	20 1	18 8
,, 14 ...	30 11	27 8	25 6	23 8	24 0	23 8	22 8	19 7	18 11
,, 21 ...	30 6	27 6	25 9	23 5	23 2	23 5	23 0	20 3	18 11
,, 28 ...	30 5	27 6	26 11	24 3	25 4	23 4	22 9	20 0	19 3
July 5 ...	30 8	27 8	27 10	25 5	21 9	22 10	22 5	19 10	19 5
,, 12 ...	30 10	27 2	28 7	24 8	23 10	23 2	22 10	19 9	19 1
,, 19 ...	30 11	27 3	29 0	23 8	23 4	23 8	22 10	19 11	19 3
,, 26 ...	31 5	27 3	29 3	25 0	22 1	24 4	22 8	19 4	19 9
Aug. 2 ...	31 8	27 6	28 10	25 0	23 1	23 10	22 10	20 0	19 4
,, 9 ...	31 7	27 7	28 7	24 11	22 1	23 7	22 11	19 4	19 8
,, 16 ...	31 7	27 4	28 10	24 9	27 2	23 3	22 2	18 9	19 11
,, 23 ...	31 5	27 3	28 10	22 10	23 7	24 10	21 11	18 1	18 8
,, 30 ...	31 7	27 0	28 8	26 2	24 3	25 2	21 0	17 10	18 1
Sept. 6 ...	29 9	26 5	28 7	24 6	25 1	25 8	19 10	17 6	17 10
,, 13 ...	27 10	26 2	28 4	27 5	24 11	25 4	19 2	17 4	17 1
,, 20 ...	27 1	26 0	28 4	26 4	25 5	26 0	18 4	17 4	17 1
,, 27 ...		25 10	28 9		25 10	26 1		17 2	17 2
Oct. 4 ...		25 8	28 9		26 3	26 2		17 7	16 10
,, 11 ...		25 9	28 9		26 5	26 2		17 6	17 1
,, 18 ...		25 10	28 4		26 8	26 5		17 8	16 11
,, 25 ...		25 11	27 11		26 10	26 3		17 5	16 11
Nov. 1 ...		26 2	27 5		26 10	26 3		17 7	16 11
,, 8 ...		26 6	27 3		27 0	25 11		17 8	16 10
,, 15 ...		26 9	27 1		26 9	25 8		18 3	17 1
,, 22 ...		27 1	27 2		26 10	25 10		18 7	17 0
,, 29 ...		27 1	27 0		26 9	25 9		18 9	17 2
Dec. 6 ...		27 1	26 10		26 7	25 11		19 0	17 4
,, 13 ...		27 2	26 9		26 8	25 7		19 3	17 1
,, 20 ...		27 7	26 7		26 8	25 7		19 8	17 2
,, 27 ...		27 7	26 4		26 8	25 10		19 10	17 2

AVERAGE PRICES of WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER in BELGIUM in the under-mentioned Months of 1902.

Month.	Wheat.		Barley.		Oats.	
1902.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
May	29	4	23	9	22	4
June	30	0	23	9	23	3
July	30	3	22	10	23	6

The above prices have been compiled from the official monthly averages published in the *Moniteur Belge.*

AVERAGE PRICES of WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER in FRANCE, and ENGLAND and WALES, in the under-mentioned Months of 1902.

MONTH.	FRANCE.		ENGLAND.	
WHEAT.				
1902.	Per Qr. *s.*	*d.*	Per Qr. *s.*	*d.*
June	37	3	30	9
July	39	8	30	11
August	38	0	31	6
BARLEY.				
1902.	Per Qr. *s.*	*d.*	Per Qr. *s.*	*d.*
June	23	7	23	10
July	23	11	24	8
August	23	5	24	8
OATS.				
1902.	Per Qr. *s.*	*d.*	Per Qr. *s.*	*d.*
June	23	3	22	10
July	23	4	22	8
August	22	3	22	2

Note.—The prices of French grain have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique.* The prices of British grain are official averages based on the weekly returns furnished under the Corn Returns Act, 1882.

AVERAGE PRICES of WHEAT, BARLEY, and OATS per IMPERIAL QUARTER at LONDON, PARIS, and BERLIN, in the under-mentioned Months of 1902.

Month.	London.		Paris.		Berlin.	
WHEAT.						
	Per Qr.		Per Qr.		Per Qr.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
May, 1902	31	10	37	10	37	2
June "	31	4	38	7	36	5
July "	31	10	41	4	—	
August "	32	0	38	11	—	
BARLEY.						
	Per Qr.		Per Qr.		Per Qr.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
May, 1902	25	1	23	9	22	10*
June "	24	9	24	0	22	10*
July "	25	0	24	0	—	
August "	25	1	23	10	—	
OATS.						
	Per Qr.		Per Qr.		Per Qr.	
	s.	*d.*	*s.*	*d.*	*s.*	*a.*
May, 1902	22	9	23	9	23	3
June "	23	0	23	10	22	8
July "	23	3	24	8	—	
August "	21	6	22	3	—	

Note.—The London quotations represent the price of British corn as returned under the Corn Returns Act, 1882; the prices of grain in Paris have been compiled from the official weekly averages published in the *Journal d' Agriculture Pratique*; the quotations for Berlin are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des deutschen Zollgebiets.*

* Prices at Breslau; no quotations for Berlin.

PRICES OF WOOL.

AVERAGE PRICES of ENGLISH WOOL, per pack of 240 lbs., in the under-mentioned Months of 1902.

(*Compiled from the "Economist."*)

DESCRIPTION.	June.	July.	August.
	£ *s.* *d.* £ *s.* *d.*	£ *s.* *d.* £ *s.* *d.*	£ *s.* *d.* £ *s.* *d.*
South Down ...	7 0 0 to 8 10 0	7 0 0 to 9 0 0	7 0 0 to 9 0 0
Half-breds ...	5 12 6 „ 6 15 0	5 10 0 „ 7 0 0	5 10 0 „ 7 0 0
Leicester ...	5 0 0 „ 5 10 0	5 0 0 „ 5 15 0	5 0 0 „ 5 15 0
Kent Fleeces ...	5 11 3 „ 5 15 0	5 10 0 „ 6 0 0	5 10 0 „ 6 0 0

AVERAGE WHOLESALE PRICES of BUTTER, MARGARINE, and CHEESE in the under-mentioned Months of 1902.

(Compiled from the "Grocer.")

DESCRIPTION.	JUNE.		JULY.		AUGUST.	
	Per Cwt. s. d.	s. d.	Per Cwt. s. d.	s. d.	Per Cwt. s. d.	s. d.
BUTTER:						
Cork, 1sts	90 0	—	89 0	—	87 0	—
,, 2nds	89 0	—	86 6	—	83 0	—
,, 3rds	88 0	—	84 6	—	81 0	—
,, 4ths	82 6	—	81 6	—	80 6	—
Friesland	93 6 to	96 0	94 0 to	96 0	89 0 to	91 0
Dutch Creameries ...	97 0 ,,	100 0	96 6 ,,	98 6	93 0 ,,	95 0
French Baskets ...	90 0 ,,	98 0	90 0 ,,	100 0	— ,,	—
,, Crocks and Firkins ...	84 0 ,,	88 0	84 0 ,,	88 0	— ,,	—
,, 2nds and 3rds...	79 0 ,,	81 0	80 0 ,,	82 0	— ,,	—
Danish and Swedish ...	105 0 ,,	108 0	105 0 ,,	107 0	102 0 ,,	106 0
Finnish	96 0 ,,	99 0	92 6 ,,	96 6	88 0 ,,	94 0
Russian and Siberian ...	85 6 ,,	94 0	81 0 ,,	89 0	78 0 ,,	88 0
Argentine	100 0 ,,	—	100 0 ,,	—	— ,,	—
Canadian and States ...	94 0 ,,	101 6	95 0 ,,	101 6	92 0 ,,	100 0
Colonial, fine	— ,,	—	— ,,	—	— ,,	—
,, good and inferior	— ,,	—	— ,,	—	— ,,	—
Fresh Rolls per doz.	9 6 ,,	12 6	9 9 ,,	12 9	9 4 ,,	12 5
MARGARINE	38 0 ,,	60 0	39 0 ,,	61 6	40 0 ,,	62 0
CHEESE:						
Cheddar	60 0 ,,	74 0	60 0 ,,	68 6	58 0 ,,	68 0
,, Loaf	66 0 ,,	74 0	65 6 ,,	71 0	66 0 ,,	68 0
Wiltshire, Loaf ...	67 0 ,,	71 6	66 0 ,,	69 0	68 0 ,,	70 0
Double Gloucester ...	61 0 ,,	65 0	60 0 ,,	63 0	58 0 ,,	60 0
Derby, Factory ...	59 0 ,,	61 0	57 0 ,,	60 0	58 0 ,,	60 0

WEEKLY PRICES (WHOLESALE) of VEGETABLES and FRUIT at COVENT GARDEN MARKET in each week of August, 1902.

(*Compiled from the "Gardeners' Chronicle."*)

Description.	Week ending									
	August 2nd.		August 9th.		August 16th.		August 23rd.		August 30th.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
VEGETABLES—										
Artichokes, Globe, per dozen	1 6 to	2 0	1 6 to	2 0	1 6 to	2 0	1 0 to	2 0	1 6 to	2 6
Beans, Broad, per bushel	1 6	—	1 3 ,,	1 6	1 3 ,,	1 6	1 3 ,,	1 6	1 3 ,,	1 6
Beans, Scarlets, per bushel	—	—	6 0	—	4 0 ,,	5 0	1 6 ,,	2 0	0 9 ,,	1 6
Beetroots, per doz.	2 6 ,,	4 0	2 6	—	2 6	—	2 6	—	2 0 ,,	2 6
Cabbage. per tally	3 0 ,,	5 0	3 0 ,,	5 0	3 0 ,,	5 0	2 0 ,,	4 0	2 0 ,,	3 0
Carrots, per dozen bunches	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0
Carrots, washed, per bag	—	—	6 0	—	6 0	—	3 0 ,,	3 6	3 0	—
Cauliflowers, per dozen	2 0 ,,	4 0	2 0 ,,	4 0	2 0 ,,	3 0	1 6 ,,	2 0	2 0 ,,	4 0
Celery, per bundle	1 0 ,,	1 3	1 0 ,,	1 3	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 3
Cress, per dozen punnets	1 3	—	1 3	—	1 3	—	1 3	—	1 3	—
Cucumbers, per doz.	2 0 ,,	4 0	1 6 ,,	2 6	1 6 ,,	2 6	1 6 ,,	2 6	1 0 ,,	2 0
Endive, new French per dozen	1 6 ,,	2 0	1 6	—	1 6 ,,	2 0	1 0	—	1 0	—
Leeks, per dozen bunches	1 6 ,,	2 0	1 6	—	1 0 ,,	1 6	1 0 ,,	1 6	1 0	—
Lettuces, Cabbage, per dozen	0 4 ,,	0 6	0 4 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6
Lettuces, Cos, per score	0 6 ,,	1 6	0 6 ,,	1 3	0 6 ,,	1 0	0 6 ,,	1 0	0 6 ,,	1 0
Marrows, Vegetable, per dozen	1 0 ,,	1 6	1 0	—	1 0	—	0 4 ,,	1 0	0 4 ,,	1 0
Mint, doz. bunches	—	—	1 6	—	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6
Mushrooms, House, per lb.	0 8 ,,	0 9	0 9 ,,	1 0	0 9 ,,	0 10	0 6 ,,	0 9	0 6 ,,	0 8
Onions, new green, doz. bunches	2 6 ,,	3 0	2 0 ,,	2 6	2 0 ,,	2 6	1 6 ,,	2 0	1 6 ,,	2 0
Onions, picklers, per sieve	3 6	—	3 6	—	2 6 ,,	3 0	2 0 ,,	2 6	2 0 ,,	2 6
Parsley, per dozen bunches	1 6 ,,	2 0	1 6 ,,	2 0	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6
Peas, English, per bushel	2 0 ,,	3 0	2 0 ,,	3 0	1 6 ,,	3 0	1 6 ,,	3 0	1 0 ,,	3 0
Peas, per bag	4 0 ,,	6 0	4 0 ,,	5 6	4 0 ,,	5 6	5 0 ,,	6 0	4 6 ,,	5 6
Potatoes, per ton	80 0 ,,	110 0	80 0 ,,	110 0	70 0 ,,	110 0	50 0 ,,	80 0	50 0 ,,	80 0
,, new, per cwt.	4 0 ,,	5 6	4 0 ,,	5 6	—	—	—	—	—	—
Radishes, per dozen bunches	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0
Salad, small, per doz. punnets	1 3	—	1 3	—	1 3	—	1 3	—	1 3	—
Shallots, per doz.	0 2	—	0 2	—	0 2	—	0 2	—	0 2	—
Spinach, English, per bushel	3 0 ,,	4 0	3 0 ,,	4 0	2 0 ,,	2 6	2 0 ,,	2 6	2 0	—
Tomatoes, English, per doz. lbs.	4 6 ,,	6 0	3 0 ,,	4 0	3 0 ,,	4 0	3 6 ,,	4 0	3 6 ,,	4 6
Tomatoes, Channel Islands, per lb.	0 4 ,,	0 5	0 3 ,,	0 3½	0 3 ,,	0 3½	0 3 ,,	0 3½	0 3 ,,	0 3½
Turnips, new, per doz.	2 6 ,,	5 0	2 6 ,,	5 0	2 6 ,,	3 0	2 0 ,,	2 6	2 0 ,,	3 6
Watercress, per dozen bunches	0 3 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6
FRUIT—										
Apples, English, per sieve	2 0 ,,	3 0	2 0 ,,	3 0	3 0 ,,	3 6	2 0 ,,	3 0	1 9 ,,	3 0
,, Quarrendons	—	—	7 0	—	5 0 ,,	6 0	5 0 ,,	6 0	4 0 ,,	6 0
,, Suffields	—	—	3 0	—	3 0	—	2 6 ,,	3 0	2 0 ,,	2 6
Cherries per sieve	6 0 ,,	8 6	6 0 ,,	12 0	—	—	—	—	—	—
Currants, Black, per sieve	8 0 ,,	9 0	8 0 ,,	9 0	8 0 ,,	8 6	—	—	—	
Currants, Red, per sieve	4 0 ,,	5 0	4 0 ,,	5 0	4 0 ,,	5 0	—	—	-	--
Gooseberries, per sieve or ½-bushel	3 0 ,,	3 6	3 0 ,,	4 0	3 0 ,,	4 0	—	—	—	—
Grapes, Alicante, per lb.	0 10 ,,	1 6	0 10 ,,	1 6	0 10 ,,	1 6	0 10 ,,	1 6	0 8 ,,	1 3
Grapes, Colmars, per lb.	1 3 ,,	1 9	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6	0 10 ,,	1 6
Grapes, Muscats, per lb.	0 10 ,,	2 6	0 9 ,,	3 0	0 9 ,,	3 0	1 0 ,,	4 0	0 8 ,,	4 0
Grapes, New Hamburg, per lb.	0 6 ,,	2 6	0 8 ,,	2 0	0 8 ,,	2 0	1 0 ,,	2 0	0 6 ,,	2 0
Peaches, per doz.	2 6 ,,	18 0	2 0 ,,	18 0	2 0 ,,	18 0	2 0 ,,	12 0	1 6 ,,	9 0

DISEASES OF ANIMALS IN GREAT BRITAIN.

NUMBER of OUTBREAKS of **Foot-and-Mouth Disease** and of **Swine-Fever,** with the Number of SWINE Slaughtered by order of the Board of Agriculture, in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Foot-and-Mouth Disease.		Swine-Fever.	
	OUTBREAKS Confirmed.	ANIMALS Attacked.	OUTBREAKS Confirmed.	SWINE Slaughtered as Diseased or as having been exposed to infection.
	No.	*No.*	*No.*	*No.*
December, 1900 ...	5	41	357	2,731
March, 1901... ...	10	652	625	3,165
June, 1901	2	17	1,490	7,066
September, 1901 ...	—	—	680	3,391
December, 1901 ...	—	—	345	1,615
March, 1902... ...	1	30	399	2,122
June, 1902	—	88	469	1,976

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax** and **Glanders** in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Anthrax.		Glanders (including **Farcy**).	
	OUTBREAKS Reported.	ANIMALS Attacked.	OUTBREAKS Reported.	ANIMALS Attacked.
	No.	*No.*	*No.*	*No.*
December, 1900 ...	159	240	259	437
March, 1901	163	223	322	571
June, 1901	193	281	327	551
September, 1901 ...	114	165	398	677
December, 1901 ...	181	302	300	571
March, 1902	202	357	285	543
June, 1902	175	268	278	489

NUMBER of CASES of **Rabies** in DOGS in GREAT BRITAIN in each of the under-mentioned periods.

THREE MONTHS ENDED.	Number of Cases.
31st December, 1900	3
31st March, 1901	1
30th June, 1901	—
30th September, 1901	—
31st December, 1901	—
31st March, 1902	8
30th June, 1902	4

DISEASES OF ANIMALS IN IRELAND.

NUMBER of OUTBREAKS of **Pleuro-Pneumonia** and of **Swine-Fever**, with the Number of CATTLE and SWINE Slaughtered by order of the Department of Agriculture and Technical Instruction in IRELAND, in each of the under-mentioned periods.

QUARTER ENDED	Pleuro-Pneumonia.			Swine-Fever.	
	OUTBREAKS Confirmed.	CATTLE found Diseased.	CATTLE Slaughtered as having been exposed to Infection.	OUTBREAKS Confirmed.	SWINE Slaughtered as Diseased, or as having been exposed to Infection.
	No.	*No.*	*No.*	*No.*	*No.*
December, 1900 ...	—	—	—	39	577
March, 1901	—	—	—	64	1,265
June, 1901	—	—	—	67	1,242
September, 1901 ...	—	—	—	72	1,089
December, 1901 ...	—	—	—	24	436
March, 1902	—	—	—	38	644
June, 1902	—	—	—	51	1,168

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax, Glanders,** and **Rabies** in IRELAND in each of the under-mentioned periods.

QUARTER ENDED	Anthrax.		Glanders (including Farcy).		Rabies. Cases Reported.	
	OUTBREAKS Reported.	ANIMALS Attacked.	OUTBREAKS Reported.	ANIMALS Attacked.	DOGS.	OTHER ANIMALS.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
September, 1900.	—	—	1	1	1	—
December, 1900..	—	—	2	2	5	1
March, 1901 ...	—	—	1	1	1	—
June, 1901 ...	1	2	3	3	—	1
September, 1901..	—	—	—	—	—	—
December, 1901..	1	2	1	2	—	—
March, 1902 ...	—	—	4	13	—	—
June, 1902 ...	—	—	2	8	—	—

ORDNANCE SURVEY MAPS.

The Ordnance Survey are issuing a new series of folding pocket maps for England and Wales on the scale of one inch to the mile. The maps are printed in colours on sheets 18 by 12 inches, mounted on canvas, in a cover or flat, price 1s. each. The one-inch map can also be procured at the same price in black and white, showing outline and contours; or in outline, with hills printed either in black or brown: the outline map has recently been revised. These maps are not only useful for general topographical purposes, but should also prove serviceable to cyclists and pedestrians, since they show all roads, indicating their character and whether metalled or not, footpaths, hills, rivers, towns, villages, railway stations, and local boundaries.

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Small scale pocket maps of the districts round the following towns are supplied to the public at the Head Post Offices in these towns on application without any charge beyond the price of the map, viz.:—Scarborough, Rochdale, Burton-on-Trent, Southport, West Hartlepool, South Shields, Luton, Worthing, Bury St. Edmunds, Huntingdon, Stafford, Macclesfield, Crewe, Stockport, Ilkley, Richmond (Yorkshire), Driffield, Sittingbourne, Cromer, Llandudno, Weymouth, Littlehampton, Greenock, Blairgowrie, and Pitlochry.

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LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE.

(*a.*) *Leaflets dealing with Insects and Fungi.*

No.	Title.	No.	Title.
1	Mites on Currant and Nut Trees.	34	The Woolly Aphis or American Blight.
2	Vine and Raspberry Weevils.	35	The Celery Fly.
3	The Turnip Fly or Flea.	38	The Carrot Fly.
4	Caterpillars on Fruit Trees.	41	The Red Spider or Spinning Mite.
5	The Mangel Wurzel Fly.	46	The Stem Eelworm.
10	Wireworms.	47	The Asparagus Beetle.
11	The Daddy Longlegs.	48	The Pea Thrips.
12	The Gooseberry Saw-fly.	49	The Fruit Tree Beetle.
14	The Raspberry Moth.	52	Gooseberry Blight.
15	The Apple Blossom Weevil.	53	The Pear Midge.
16	The Apple Sucker.	56	The Canker Fungus.
19	Pea and Bean Weevil.	60	The Wood Leopard Moth.
20	The Magpie Moth.	62	Pear and Cherry Saw-fly.
21	The Warble Fly.	64	White Root Rot.
22	The Diamond Back Moth.	65	The Small Ermine Moths.
23	Potato Disease.	68	Currant Aphides.
24	The Ribbon Footed Corn-fly.	69	Tent Caterpillars.
25	The Cockchafer.	70	Winter Washing of Fruit Trees.
30	The Codlin Moth.	71	The Colorado Beetle.
31	The Onion Fly.		
33	Surface Caterpillars.		

(*b.*) *Leaflets dealing with Birds useful to Agriculture.*

40	The Kestrel or Windhover.	45	The Starling.
42	The Short-Eared Owl.	50	Water Wagtails or "Dishwashers."
43	Titmice.	51	The White or Barn Owl.
44	The Common Lapwing, Plover, or Peewit.	54	The Spotted Flycatcher.
		55	The Swallow.

(*c.*) *Leaflets dealing with Diseases of Animals.*

28	Anthrax.	37	Rabies. (*Out of Print.*)
29	Swine Fever.	61	Sheep Scab.

(*d.*) *Leaflets relating to Acts of Parliament.*

8	Farmers and Assessments to Local Rates.	26	Farmers and the Income Tax.
17	Preservation of Commons. (*Out of print.*)	27	Remission of Tithe Rentcharge.
18	Fertilisers and Feeding Stuffs Act.	39	Assessment to Land Tax.
		59	Improvement of Land Act, 1899.
		66	Workmen's Compensation Act, 1900.

(*e.*) *Leaflets dealing with Miscellaneous Subjects.*

6	The Field Vole.	57	External Parasites of Poultry.
7	Autumn Catch Crops and Fodder Supply. (*Out of print.*)	58	Internal Parasites of Poultry.
9	Ensilage.	63	Destruction of Charlock.
13	Acorn Poisoning.	67	Favus in Poultry.
32	Foul Brood or Bee Pest.	72	Purchase of Artificial Manures.
36	Cultivation of Osiers.	73	Cultivation of Maize for Fodder.

Copies of these Leaflets may be obtained free of charge and post free on application to the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

THE JOURNAL

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FARMYARD MANURE.

The substance that goes by the name of farmyard manure, fold manure, dung, or muck, chiefly consists of (*a*) the material that was used as litter, usually straw, sometimes peat, fern, sawdust, &c.; (*b*) the food that passed through the animals in an undigested condition and has been voided in the solid form; and (*c*) the urine, which contains that part of the food which the animals digested but did not retain in their system. The urine also contains the waste of the tissues of the animal's body. The proportions of these parts will vary with circumstances. For instance, when it is the object of the farmer to break down as much straw as possible, a relatively large amount of the farmyard manure will consist of litter, but where litter is used very sparingly—as in upland dairies—the manure will consist very largely of the solid and liquid excreta.

All food contains more or less water; even in such substances as grain or cake one-seventh or one-eighth, while in others, like turnips, nine-tenths is pure water. Neglecting this water, it may be said that, for every 100 lb. of food that an animal consumes, about 50 lb. reappear in the dung or urine; the other 50 lb. being burned up in its system, becoming gas or water, or being stored up in its body as bone, flesh, fat, hair, &c. A well-grown bullock or cow—weighing, say, 9 cwt.—will consume daily, if on full ration, about 24 lb. of absolutely dry food, as, for example:—

56 lb. Roots (90 per cent. water)	... =	5·6 lb. dry.
6 ,, Cake or Meal (12 per cent. water)	=	5·3 ,,
16 ,, Hay or Straw (16 per cent. water)	=	13·4 ,,
Total	...	24·3 lb. of dry matter.

One-half of this, say 12 lb., will reappear as manure, and to this has to be added the whole of the dry matter in the litter, say 10 lb., making the daily output of dry matter in farmyard manure 22 lb. Needless to say, it may be much more or much less, depending on the age and size of the animals, and on the way in which they are fed and littered. Ordinary farmyard manure is, of course, not dry; on the contrary, it contains about 75 per cent. of water. The daily output will therefore weigh not 22 lb. but 88 lb., say $\frac{3}{4}$ cwt. Thus on a six months' keep the amount of farmyard manure yielded will be about $6\frac{1}{2}$ tons. This calculation applies to full-grown cattle; if the stock consists, as it generally does, of a fair proportion of younger animals, the output per head may be only 3 or 4 tons. It follows that on a farm with a mixed stock of 50 head, comprising 3 or 4 horses, enough dung should be produced during winter to give a dressing of 10 or 12 tons per acre to about 15—20 acres of land, or 3—4 acres less when allowance is made for loss during storage.

From the manurial point of view the three substances that are of most importance in the food are nitrogen, phosphoric acid, and potash. Although only one-half of the solid matter in the food reappears in the manure, at least three-quarters of the nitrogen, and nine-tenths of the phosphoric acid and potash, are voided. These proportions will be considerably reduced in the case of very young animals, and increased in the case of fattening cattle. Of the nitrogen that passes through an animal a larger proportion finds its way out in the urine than in the solid excreta. The same is true of the potash, whereas the phosphoric acid—*i.e.*, the phosphates—are chiefly voided in the dung. It will thus be seen that two of the three valuable elements of plant-food are more abundant in the liquids than in the solids of animal excreta, and, not only so, but, pound for pound, the substances in the liquids are much more valuable for crops because they are much more readily available. The Rothamsted experiments have shown that much of the nitrogen in the solid part of dung can hardly be said to be of any use to plants, whereas the nitrogen of the liquid portion is almost as active and therefore as valuable as nitrate of soda or sulphate of ammonia.

In a ton of ordinary farmyard manure there is as much nitrogen, phosphate, and potash as in twelve or fifteen shillings'

worth of artificial manure, and if a ton of dung is not usually valued at even half these figures this is chiefly because a large part of the three substances mentioned never becomes available, or is lost before crops can make use of it. True, a ton of farmyard manure is more expensive to handle than 2 or 3 cwt. of artificials, and this, of course, reduces its relative value ; but, on the other hand, farmyard manure has a beneficial influence on crops just because it is a heavy bulky substance, so that these two considerations may be held roughly to balance or cancel each other.

Variation in the Quality and Character of Dung.

This is affected by :—

The Kind of Food : Food rich in fertilizing materials, especially nitrogen, produces rich dung.

The Kind of Animal : Horses produce dry, hot dung that ferments and acts quickly, but does not last long, whereas the dung of cattle and pigs is cold, slow-acting, and more durable. The dung of young stores and dairy cows is rather poor in all the important elements of plant-food, because, in the former case, these elements have, to a relatively large extent, gone to form bone and muscle, while in the latter case they have found their way into the milk. For instance, to quote the Rothamsted figures, while the excreta of a fattening bullock getting decorticated cotton cake will contain about 97 per cent. of the nitrogen, 96 per cent. of the phosphoric acid, and 99 per cent. of the potash present in the cake, the corresponding figures for a milk cow are only 87 per cent. for the nitrogen, 89 per cent. for the phosphoric acid, and 86 per cent. for the potash. This means that for every 3 lb. of nitrogen, 4 lb. of phosphoric acid, and 1 lb. of potash that the fattening bullock abstracts, the milk cow appropriates 13 lb., 11 lb., and 14 lb. respectively.

The Age of the Dung : Rotten dung is richer and more active, provided it has been properly "made," than comparatively fresh undecomposed material.

The Manner of Storage : Properly-managed dung is more valuable than that which has been mismanaged.

Treatment of Dung in the Homestead.

Attention should be given to:

The Prevention of the Escape of Liquids, for these hold the larger and much more valuable part of the plant-food. These may drain into the ground if the floor of the yard or dung-heap be porous, therefore the surface on which the mass rests must be water-tight. More frequently, perhaps, they are allowed to run away in a surface stream, and unless this can be led on to a meadow or other field, the loss may be very serious. The floor of the dungstead should not only be impervious to the passage of liquids, but it should have a distinct slope backwards, so that the front is two or three feet higher than the back. No doubt concrete is the most satisfactory form of floor, but no great waste, if any, will take place through a foot of well-beaten clay overlaid by rubble.

Over-heating is productive of loss in various directions. The heat that is always more or less associated with a mass of dung shows that actual burning is going on, and, in the process, nitrogen escapes into the air. The weight of organic matter is also reduced, and as part of the value of farmyard manure is due to its being a bulky organic substance, it is undesirable to have this substance largely consumed in the dung-heap. During a winter's storage the loss of weight will usually be about 20 to 30 per cent., but it may be double this, and when the loss is excessive the capacity of the mass to suck up and retain liquids is correspondingly reduced. Moderate decomposition cannot be avoided, and is not to be regretted, for if no loss has occurred by drainage, and but little by the air, the smaller mass will contain practically all the original plant-food, and this, too, in a more portable and convenient form. If, for instance, 5 tons have shrunk to 4 tons the value of the latter quantity should be as great as the former, so that if 5 tons of fresh dung are worth 15s.—*i.e.*, 3s. per ton—4 tons of matured dung will still be worth 15s.—*i.e.*, 3s. 9d. per ton.

Over-heating is avoided by keeping the mass well compressed; and this is secured by the treading of animals—as in yards, courts, or boxes,—or by wheeling each barrow-load or cart-load over what was there before, or by loading on soil or rotten turf. The mass should also be kept saturated with moisture, and this is

best secured by preventing the escape of liquids. With dung of a very dry character (horse manure), especially in a covered dungstead, it may be desirable to add water, but only if there is no chance of superfluous moisture escaping by drainage.

If manure is stored in a compact, deep dungstead, with a properly constructed floor, and if care be taken to prevent its getting more water than falls directly on it in the form of rain or snow, there is no need to cover it in. Loss by excessive washing can be better prevented by other means than by erecting a roof over the mass. It is obvious that the advantages of a covered dung-heap will be greatest in a district of heavy rainfall, but in any case it is doubtful if it will pay to provide a roof for the dungstead unless it can be also used as a cattle-shed.

Many farmers prevent loss due to escaping liquids by leading these directly on to the land, or by conducting them to a tank which is periodically emptied into a liquid manure cart and distributed over the land. If the character and lie of the fields suit such methods of treatment, they are in every way commendable, but local circumstances often make it difficult or impossible to carry them out.

Over-heating and excessive loss of weight are obviated by compression and saturation, simply because the dung-heap under these conditions contains comparatively little air, and air is a necessity of fermentation and decomposition.

To bring raw manure into a rotten condition, farmers often turn it over once or twice, the result of which is that air permeates the whole mass, and great heat is developed, with corresponding loss of weight. No doubt there are circumstances where such treatment is expedient ; but, considering the cost of labour and the loss of organic matter, and, to some extent, of nitrogen, it is probable that the process is often performed when it would be better avoided. The familiar example of the slow combustion of a "backed" or "banked" fire of coals is strictly comparable with what takes place in a well-packed mass of dung, while in both cases rapid combustion, with concurrent disappearance of solid material, will follow vigorous stirring.

Equality of Composition throughout the whole mass should be secured as far as possible, or otherwise the best results both in the heap and on the crop will not be secured. The dung from

the stable, cow byre, feeding byre, store byre, and piggeries has, in each case, its own characteristics, and the mingling of all will produce, on the whole, better material than having the horse dung in one part, the cattle dung in another, and the pig dung in a third. The wet, inert, cold character of byre dung will add moisture to the stable dung and prevent its being over-heated ("fire-fanged" it is sometimes called), while the rich manure from the feeding boxes will improve the quality of the dung of the store cattle.

Conservation Agents.

From time to time attention has been directed to the prevention of loss in manure heaps through adding gypsum, superphosphate of lime, kainit, or sulphuric acid. On the whole, it cannot be said that any of these has much effect. The admixture of soil with dung, however, is always to be recommended, provided such material can be obtained at little expense for labour. To give the best results, the soil so employed must be of a loamy character, and, if possible, rich in organic matter. Its effects are to fix ammonia, to encourage the formation of nitrates, to assist in consolidating the mass, and to suck up and retain liquids. Needless to say, soil so employed must not contain the seeds of troublesome weeds or the germs of plant-diseases, such as finger-and-toe. Moss litter or peat is also an excellent fixer of ammonia and absorbent of liquids, and, if for nothing else than to improve the manure heap, it is a good plan to have a little in use for some of the live-stock. Such peaty manure, unless it is being used in a yard, should daily be spread in the dungstead, and the quality of the resulting mass will be thereby appreciably improved.

Treatment of Dung in the Field.

To save carting in spring, or to empty the dungstead or the yards, it is a usual practice, in the course of the winter, to form large field storage heaps. Doubtless, in most cases, this practice is thoroughly justifiable, though the fact cannot be overlooked that the opportunities for loss in such heaps are much greater than in a proper dungstead, so that field heaps should only be formed if they are the means of gaining an important end.

Where these heaps must be formed they should be placed on firm, level ground, and they should be made as deep and firm as possible. The so-called "draw heaps," on to which each cart-load is drawn, thereby consolidating the mass, are the best. Subsequently the sides are trimmed up, and the whole should be covered with a layer of soil or ashes about a foot thick. Such a covering consolidates the mass, prevents to some extent ammonia rising into the air, and runs off rain water.

When dung comes to be spread on the land, it should be distributed as equally as possible. Sometimes, unfortunately, one sees great lack of care in this respect. In some districts dung is roughly spread straight from the cart, the finishing touches being subsequently given. In other districts, and more frequently, it is laid down in small heaps about six yards apart. If it is immediately spread, no objection can be taken to the system, though it may be said that if the dung is very old, and especially if it is largely made from moss litter, the spots on which the heaps rest are apt to be left over-manured, and especially is this the case on rough meadows. Too often one sees these small heaps lying for days, and even for weeks, unspread, with the result that the rain washes "the goodness" from the dung into the patches on which the heaps rest. These patches are consequently over-manured, whereas the rest of the field, being supplied with impoverished dung, suffers from insufficient nourishment.

With farmyard manure, even more than with artificials, the farmer should so arrange matters that the quantity of dung at his disposal is distributed over as large an area as is consistent with practical convenience. For instance, twenty tons of dung spread equally on two acres will give a much better return than the same quantity spread on one acre, and yet this rule is often neglected.

As regards the time of year when dung should be applied, much depends on the circumstances of the particular case. By far the greater quantity of dung goes on to meadows and green crops and it may be said that in the former case autumn or early winter is the best time to make the application. The complete stocking of the ground with plants obviates much loss of soluble matters by washing. On farms entirely under grass there is no

choice but to employ the dung on meadows or pastures, and on such farms it would be bad practice not to cart out all available dung in autumn. Of course, the dungstead will again fill up during winter, and on the whole it is probably better to distribute this additional supply in spring than to leave it in the heap, subject to waste and yielding no return, till the following autumn. Late spring dressings, however, unless the dung is very "short"—*e.g.*, dung made with moss litter—interfere with the work of the mowing-machine, though this can be avoided by chain-harrowing and raking the roughness off two or three months after dressing.

In the case of green crops part of the dung may with advantage be ploughed in during autumn, but only on clean strong land in a dry district. But if foul and especially strong land has to be cleaned in spring it will be found that autumn dung, by holding moisture, retards the getting of the land into condition in spring. In any case the work of the cultivator brings much of the dung to the surface, and this, being collected with the weeds, is carted off the land again, or possibly wasted by burning. Farmyard manure ploughed in during autumn will decay more rapidly than if left in the dung-heap, so that a relatively larger proportion will be available for the use of the first crop. But just on this account the succeeding crops will not get so much benefit, and this fact has to be borne in mind in estimating the respective advantages of autumn and spring dressings.

MILKING AND BUTTER-TEST TRIALS.

It will, I think, scarcely be denied, even by the most prejudiced, that during the latter half of the past century great changes have taken place in the agricultural world, and in no department, perhaps, has more improvement been shown than in the breeding of live stock.

The value of pedigree, the knowledge that "like produces like," coupled with the large amount of money that has been given in prizes at the various agricultural shows, have all tended to the same end; but, unfortunately, with the exception of the Channel Island cattle, beef has been the ultimate aim of the breeders of cow stock. The final idea of the butcher has been predominant, and the tendency and ability to put on flesh quickly and, therefore, economically, has over-ridden all other points, with the result that the milking properties in some of the older breeds of cattle have been almost bred out. This may appear an exaggeration, but it can hardly be gainsaid when one finds that, at a recent show, the judges were unable to award a Breed Society's prize, because the animals which received honours in the inspection classes could not obtain the number of points in the milking trials necessary to qualify, while those which obtained the proper number of points in the milking trials were not noticed by the inspection judge.

With a view to encourage the improvement of dairy cattle, milking and butter-test prizes were initiated some few years since; but owing to the absence in the former of a condition precedent insisting on pedigree, the good that might have resulted has in many cases been neutralised, the bulk of the winners in the heavy weight classes being generally cross-bred, or cows without registered ancestry. In the butter-test classes for Jersey and Guernsey cattle, pedigree has always been insisted upon, with a correspondingly good result.

Milking Trials.

Milking trials were first started at the London Dairy Show some twenty-five years since, but prior to 1880 the prizes were

awarded by the simple test of measure or weight, irrespective of quality, composition, or the lapse of time since parturition, so that the first trials did not show the real value of the cow, the prizes generally going to those recently calved. As time went on, fresh conditions were introduced, and the rules now in force at the London Dairy Show are as follows :—

Cows and heifers to compete must have calved fourteen days before the opening of the show ;

One point is awarded for every ten days since calving, deducting the first forty days, with a maximum of 14 points ;

One point for every pound of milk, taking the average of two days' yield ;

Twenty points for every pound of butter fat produced ;

Four points for every pound of solids other than fat ;

Deductions.—Ten points each time the fat is below 3 per cent. ;

Ten points each time the solids, other than fat, fall below 8·5 per cent. ;

No prize is given in the milking trials unless the animals come up to the following standard :—

Pedigree Shorthorns	90 points.
Non-pedigree Shorthorns	120 ,,
Jerseys...	95 ,,
Guernseys	90 ,,
Red Polled	90 ,,
Ayrshires	100 ,,
Kerries and Dexters	75 ,,

The next milking trials in order of date of institution are those held at the Tring Agricultural Association's Show. These have now been going on since 1893, and in actual numbers have far surpassed any trials that have taken place in this country. They have always been open to all breeds and crosses, the classes being divided into two, viz., those above and those under 900 lb. live weight. The advantage that the Tring trials have over all others is that all the cows competing have to be entered in both the milking and butter-test classes, whereas at other shows this is optional. The conditions at Tring are simpler than at the Dairy Show, weight and lactation only being taken into account, but where the milk contains less than 3 per cent. fat disqualification follows.

The points given are as follows :—

One point for every pound of milk, ounces being worked out in decimals ;

One point for every ten days since calving, deducting the first 40 days ; maximum allowance for lactation, 12 points.

At the Bath and West of England Society's shows, milking trials have been held since 1898. The points are the same as those at Tring, except that the average of the two milkings must show 12 per cent. of total solids, of which not less than 3·25 per cent. shall be fat. The cattle, as at Tring, are divided into two classes, viz : those over and those under 900 lb. live weight.

Milking trials have also been held for the past two years at the Royal Dublin Society's Spring Show, the following being the scale of points :—

One point for every pound of milk, taking the average of the two days' milkings ;

Twenty points for every point of butter fat percentage ;

Four points for every point of solids other than fat ;

Ten points are deducted when the milk is under 3 per cent. fat, and under 8·5 solids other than butter fat ;

One point is given for every completed ten days since calving, deducting the first forty days ; maximum allowance for lactation, 14 points.

The conditions and points, under which the trials at these different shows are conducted, have been set forth at length, as they differ slightly one from another. In my opinion, there is one condition which should be common to all, viz., that no animal should be eligible for a prize if her milk contains less than 3 per cent. fat, or less than 8·5 per cent. of solids other than fat, where a full analysis is made ; or less than 3 per cent. fat, where the Gerber or Babcock system is used.

Butter-Test Trials.

Trials to ascertain the amount of butter yielded by a cow in a given time, by the practical test of the churn, were first held in 1886, at the London Dairy Show, the prizes being given by the English Jersey Cattle Society for pedigree Jerseys only. The results were so satisfactory to breeders of those cattle that similar prizes were offered to other societies, and now for some

years these butter-test trials have taken place at many of the leading agricultural shows.

Of these, the Bath and West of England, Tring, and London Dairy Shows are the most important, as the classes are open to all breeds ; and as the cows are often entered in both the milking and butter-test trials, information, other than the actual weight of produce, has been forthcoming.

The scale of points under which these trials have been carried out are as follows :—

One point for every ounce of butter obtained, fractions of ounces being shown in decimals ;

One point for every ten days since calving, deducting the first forty days ; maximum allowance for lactation, 12 points.

As the weight of butter, and the period of lactation, are the features of these trials, no points are given for the quality of butter ; but the butters are all judged for colour and quality, the information derived therefrom being most interesting.

To carry out these trials satisfactorily, it is obvious that (*a*) the cows must be milked out at regular set times ; (*b*) the milks must be separated and churned under similar conditions, the question of temperature in both these processes being very important ; (*c*) the butters must be dried and worked as evenly as possible.

To many people, practical trials, such as these, are of passing moment only. Such or such a cow made a good record, is the usual remark, or, perhaps, words deprecating the value of such trials altogether are used, the contention being that trials lasting only a single day are unfair to the individual cow or to the breeds competing. It will be my endeavour briefly to try and justify the usefulness of both these competitions from the figures and reports that have been published after each contest, and to show that some practical good has been derived from them, and further, that even more may be expected in the future.

What has been already noted may be divided into two heads ; (1) that relating to the cattle, and (2) that relating to the milk, under which, of course, any matters of interest connected with dairy work will naturally come.

First, with regard to the cattle. If any breeder were to go to (say) the Tring Show, look first at the award card, and then go

and examine the cows which had won honours, he would be struck at once by the shapes of the animals. He would find that the characteristics of the butcher's beast were wanting, and that the cows were all more or less wedge-shaped. He would notice many other attributes which cannot be gone into thoroughly here, differentiating the milk and butter cow from the beef animal, such as size and shape of the udder, touch, and other peculiarities.

If he further noted the lactation points, and compared them with the animals to which they were respectively allotted, he would learn the value of the "Escutcheon" theory, so little understood and, consequently, so much underestimated.

If he studied the butter ratio figures, singled out the low ones, and then "handled" the particular cows, he would appreciate the difference in touch between a poor and a rich milker, and by comparing the weights of milk with the yields of butter, he would further satisfy himself of the truth of the old rule—the larger the quantity, the poorer the quality of milk.

But as comparatively few people can get to the shows where these trials are held, and, even when they do, cannot give the time necessary to make the comparisons suggested above, one must see whether, by looking at the recorded figures of the trials and the pedigrees in the Herd Books, some information cannot be elicited. And, first, it must be remembered that the real object of these trials is to improve the milking and butter-producing properties of dairy cattle. Pedigree, therefore, is essential, but, unfortunately, with the exception of the Channel Islands cattle, the entries of registered cows have been of such recent date that instances illustrating what can be done by careful breeding in these particulars are very few.

With the Jerseys there is no such difficulty, but as the Herd Book records are easily obtainable, one example will suffice. This will show that "like produces like" on both the sire's and dam's side.

Jersey cow, tested in 1901, gave 2 lb. 10½ oz. butter, 104 days in milk; her dam, tested in 1898, gave 1 lb. 15½ oz. butter, 153 days in milk; her grand dam, tested in 1898, gave 2 lb. 5¾ oz. butter, 110 days in milk; her great grand dam, tested in 1890, gave 2 lb. 8¾ oz. butter.

The sire of the first cow was from an animal tested in 1895, which made 2 lb. $3\frac{1}{4}$ oz. in the day.

The following illustrates the value of using a bull descended from milking ancestors:—A red Lincoln bull, whose dam won the first prize and the Lord Mayor's Cup at the London Dairy Show, 1885, sired the second prize winner at the Royal Agricultural Society of England's Shows at Birmingham and Maidstone in 1898 and 1899, which yielded an average during a period of $7\frac{1}{2}$ years of 1,100 gallons of milk per annum.

The third and last example is an instance of regular breeding by a good milking dam:—A red Lincoln cow, with fifth calf, gave 911 gallons milk in 46 weeks; her daughter, No. 1, gave 802 gallons milk in 41 weeks; her daughter, No. 2, gave 773 gallons milk in 36 weeks; her daughter, No. 3, gave 532 gallons milk in 18 weeks, and is still milking well. No. 2 cow won first prize for milking at the Oxfordshire and the Bath and West of England Shows in 1901 and 1902.

Another noticeable feature, brought out by the figures given at these trials, is the tendency of certain breeds to keep up the flow of milk for an extended period. Prolonged lactation in a dairy cow is most valuable, if for no other reason than that it prevents them putting on flesh at a time when they should be kept low for fear of parturient apoplexy. Of all breeds, the Jerseys seem to be the most persistent milkers, which is, I believe, mainly owing to careful selection of sires, to the practice prevalent in the Island for many years of judging bulls with their dams, and to the attention given by the old breeders to the "Escutcheon" theory, which in this respect is, in my opinion, of the greatest value.

But perhaps the most important fact that the combined trials have brought out is the variation in the quality of the milks of the different breeds of cattle. The analyses in the milking trials, and the butter ratios (*i.e.*, the number of pounds of milk required to make a pound of butter) in the butter-test trials show these differences, but as average figures are fairer than individual records, I have taken the following from the milking and butter test reports from the London Dairy Show for the year 1901.*

* Journal of the British Dairy Farmers' Association, Vol. 16.

The average composition of the milks of cattle exhibited at the London Dairy Show during ten years were as follows :—

Breed.	Fat.	Solids other than Fat.
Shorthorns	3·82	9·10
Jerseys	5·29	9·31
Guernseys	4·71	9·14
Red Polled	3·62	9·02
Ayrshires	4·09	9·12
Kerries...	4·09	8·99

The average butter ratios of the milks of cattle tested at the London Dairy Show from 1895 to 1900, inclusive, were as follows :—

No.	Breed.	lb.
106	Shorthorns	28·81
126	Jerseys	19·15
23	Guernseys...	21·86
30	Red Polled	30·29

The average butter ratios of the cows tested at the Tring and London Dairy Shows in 1901 and 1902 are given next, to show that, although the ratios may differ slightly from year to year, the relative positions of the breeds do not vary much :—

	1901.			1902.	
Breeds.	Tring.	London.		Tring.	London.
Shorthorns	28·47	26·69	...	27·24	27·38
Jerseys	20·03	17·83	...	19·62	18·46
Guernseys	20·90	21·43	...	—	21·46
Red Polled	—	25·50	...	—	26·84

These double sets of figures (the chemical and the practical) demonstrate the fairness of the so-called standard of milk, and that it should be quite possible to supply milk well above 3 per cent. fat and 8·5 solids other than fat.

They also show the pecuniary value of the milks of the different breeds, and how wasteful it is (*a*) to make butter out of some milks, and (*b*) to sell the richer milks at the same price as that obtained for the poorer qualities. If the calculated weight of fat is compared with the weight of butter churned, it will be found that some milks yield more and some less butter than the analytical figures show. This naturally brings one to the consideration of some matters of interest connected with dairy work, the first of which, the non-churnability of milk, deserves a passing notice.

At all those shows where the double trials have taken place there has been a marked difference between the churnability of some milks as compared with others, and the milks have generally ranged themselves under the different breeds of cattle, without requiring any systematic sorting. It would be beyond the scope of this article to go thoroughly into this question, as it has been already discussed in the Journal of the Bath and West of England Society for 1901—02. It is sufficient to state here that the want of uniformity in the size of the fat globules in the milk is undoubtedly the cause. This question of non-churnability has an important bearing on these trials, as it shows that a chemical analysis is not a fair way of estimating the value of a cow for butter production, since, although the analysis will give the correct amount of fat, it cannot state how much, or how little, of that fat will be converted into butter at the first or any subsequent churning.

Another fact, and a not unimportant one, demonstrated by the butter-test trials, is that colour and quality of butter go hand in hand, and similarly in the case of milk. All the butters are judged, and the best butters are invariably those which are the deepest in colour, while the poorer qualities of butter (and there are often a good many of these) are light in colour, indeed, sometimes almost white. The size of the fat globules has, undoubtedly, something to do with this, as the butters which are made from the milks credited with large and uniform-sized fat globules are invariably the best in every way.

The influence of food is also seen in the butter made at these trials, but whether food affects the size of the fat globules is a matter not yet investigated. At Tring all (and at the other shows a good proportion of) the cows are entered in both trials consequently the feeding is reflected in the butter. A cow giving a large quantity of milk is usually fed with a view to win a milking prize, while those yielding rich milk only compete for a butter prize. An examination of the butter tells almost to a certainty with what object the cow has been fed. The butter from the milks of those cattle which are milking heavily is, as a rule, inferior both in colour and texture, while the flavour is also bad. It is frequently difficult to work and make up, and looks as if it contained an excess of water. On the other

hand, the butter made from the milks of those animals which do not expect to win a prize in the milking trials is usually good in quality, flavour and texture. As every lot of cream is treated alike, the dairy work cannot be held responsible for these differences, and therefore injudicious feeding, in the absence of any other cause, must be the reason. Looking at some of the inferior, almost nasty, butters which I have seen made at these trials, the thought has often occurred to me, can milk which produces such butters be fit for human food?

Before concluding, I would refer shortly to an objection that has been made to these trials, viz., that as cows will not milk so well in the show-yard as at home, the trials are not a reliable guide to the value of the particular animals tested; that, consequently, the averages are not correct; and that, therefore, they are not worth the labour and trouble expended on them. The large individual yields of milk and butter chronicled in the records of the trials show that all cattle are not equally affected by strange surroundings, but, of course, some cows are more sensitive than others, and do not do themselves justice. That these trials are fairly accurate, however, is shown by the report of the butter-test trials carried out by the Somerset County Council at their Experimental Farm at Bickenhall.

The trials lasted a year, from April, 1901, to April, 1902, the tests being taken fortnightly. The two breeds selected were Shorthorns and Jerseys, there being six of the former and nine of the latter. The average butter ratios of the cows were: Shorthorns, 27·13 lb.; Jerseys, 18·89 lb. If these ratios are compared with the ratios of the cattle tested at the Tring and London Dairy Shows given above, they will be found to correspond closely; but if the ratios of the Jerseys alone are taken, and are compared with the ratios of all the Jerseys tested publicly from 1886 to 1901, numbering 1,321, the difference is still smaller, being 18·99 lb. against 18·89 lb.*

It has also been urged against these trials that the cattle exhibited are not average specimens of their respective breeds, being far too good. This objection might equally be made to the winners in every inspection class. The aim of all agricultural shows should be educational, and therefore to take

* English Jersey Cattle Society's Herd Book Vol 13, page 447.

exception to the winners in any class as too good, seems ridiculous. If, however, the milk records, published from time to time by some of our best breeders, are compared with the yields of milk and the periods of lactation given in the reports of these trials, the average figures will be again found to approximate closely.

Expense is, of course, a matter for consideration, especially in these days when there are so many shows that it is not safe to reckon on getting a good gate, but as there is usually a working dairy at any show that lasts over two days (and trials of this sort should have at least three days allowed them), the extra cost of carrying them out cannot be a large item. The real question is: Are these trials worth anything at all? If they are, the expenses incurred in carrying them out should be a secondary consideration. The good that has resulted from them in the neighbourhood of Tring is a matter of common knowledge, and I believe that if only similar trials could take place in other dairy districts, equally good results would follow. Both the milking and butter-test trials are practical, and are not dependent on the particular fancy of the judge. They afford the only opportunity to breeders of milking stock to demonstrate the goodness of their animals, and, although there is this drawback, that appearance counts for nothing, yet experience has shown that good looks must be combined with utility if good prices are to be realised.

Milking trials with the "Gerber" or "Babcock" testers could well be carried out at the smaller agricultural shows, where they might take the place of the "classes for dairy cattle." In nine cases out of ten, where these latter classes are well filled, the prizes usually fall to those animals which, if sold, would fetch the highest price from the butcher. This is no exaggeration. I speak from my own experience, but perhaps the remark which I overheard at this year's London Dairy Show will best exemplify the last sentence. Behind a large-framed fleshy cow, that did no good at all in the trials, stood one, whom from his appearance I took to be an old-fashioned farmer and breeder. Examining the animal carefully, he turned round to his friend and said, "That be a nice bullock."

ERNEST MATHEWS.

SOME POTATO DISEASES.

I.—Black Scab.

Oedomyces leproides (Trabut).

This parasitic fungus was first observed attacking beetroot growing in the grounds of the School of Agriculture at Rouiba, near Algiers. Irregularly wrinkled outgrowths, varying in size from that of a pea to a walnut, originate near the top of the root. These tumours or outgrowths, when mature, contain numerous irregularly-shaped cavities filled with the dark coloured resting-spores of the fungus.

During the autumn of 1901 a diseased potato was received at the Board of Agriculture for investigation and report from the neighbourhood of Liverpool. A note accompanying the specimen stated that nearly all the potatoes were attacked by a similar disease. Microscopic examination showed that the disease was identical with the one attacking beetroot as described above. During the present season potatoes attacked by this disease have been received from widely separated localities in England. An English-grown beetroot attacked by the same disease has also been examined.

On the potato the fungus does not cause tumour-like outgrowths, but a continuous rough or nodulose, black, scab-like, thick crust, which commences at one or several distinct points, and finally covers the entire surface of the potato.

The central portion of diseased tubers remains sound for a considerable period; in fact, the fungus never spreads beyond the surface layer, and if left lying on the ground the entire tuber becomes dry and eventually crumbles to pieces, thus liberating the resting-spores into the soil, where they remain in an unchanged condition until the following year.

The disease is most prevalent on dry sandy ground.

Preventive Measures.

Diseased roots and tubers should be very carefully collected and *burned or deeply buried*, because if allowed to rot on the

ground resting-spores of the fungus would be liberated into the soil and future crops thereby endangered.

The temptation to feed stock with diseased potatoes must also be resisted, otherwise the resting-spores of the fungus, after passing uninjured through the intestinal canal of some animal, would eventually be returned to the land along with manure.

Land that has produced a diseased crop should receive a liberal dressing of gas-lime, or of ordinary lime if the former is not available.

Matters outside the sphere of the present communication, such as synonymy, affinities, &c., may be obtained from the following literature on the subject.

Trabut; in Rev. Gen. Bot. VI., 409, 1 pl. (1894).

Saccardo & Mattirolo; in Malpighia, X. (1895).

Magnus; in Ann. Bot. XI., p. 87, pl. VII. & VIII. (1897).

Description of Figures (Plate I.).

1. Potato partly covered with "black scab" *(Oedomyces leproides)*. Nat. size.

2. Section of scabbed portion of a potato, showing the uneven surface. × 5.

3. Section through a nodule of the scab, showing cavities containing resting-spores of the fungus. × 50.

4. Portion of tissue of a nodule containing resting-spores. × 700.

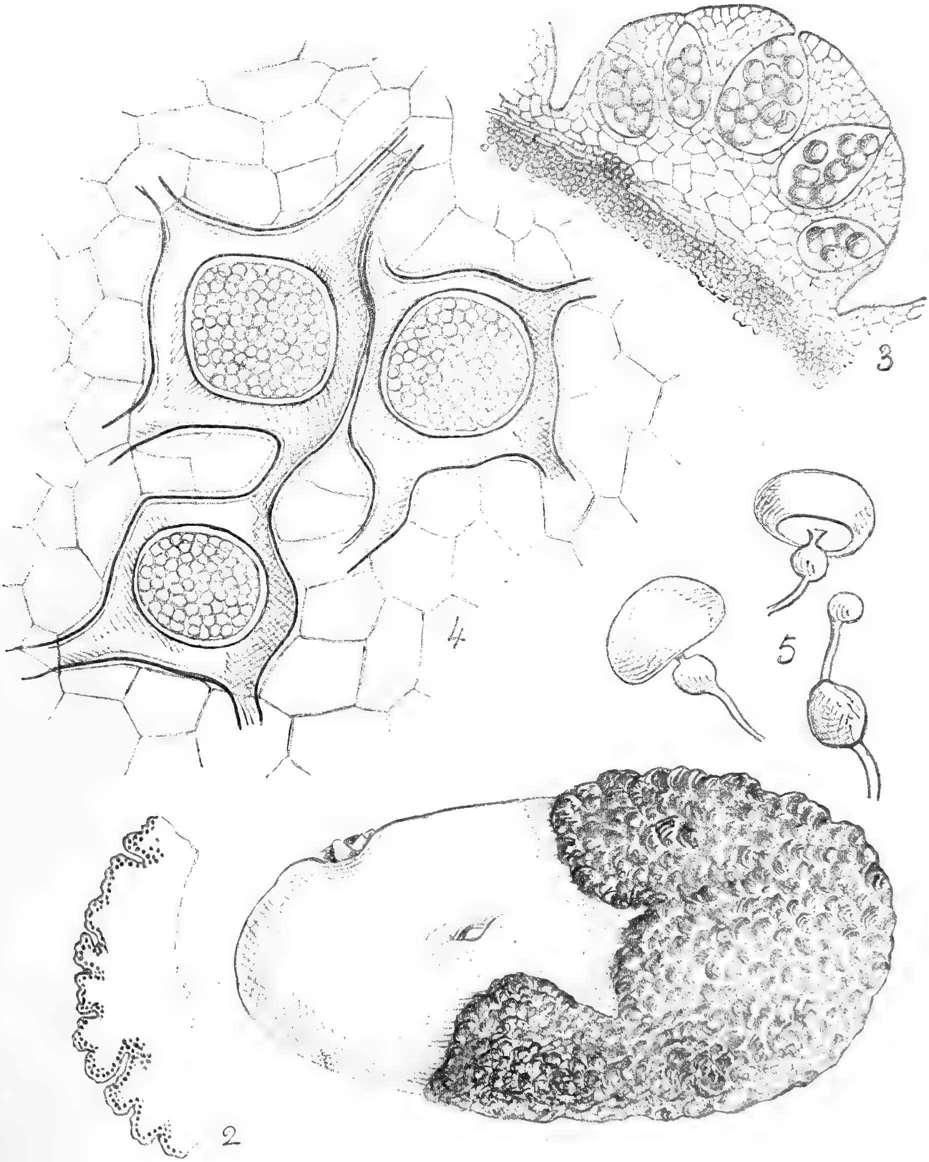
5. Spores of the fungus. × 500.

II.—BACTERIOSIS OF POTATOES.

Bacillus solanacearum (E. F. Smith).

A bacterial disease of potatoes which is very widely spread and destructive in the United States has, unfortunately, been recorded from several localities in this country during the present season.

The earliest indication of the presence of the parasite is the sudden wilting of the leaves, which soon hang limp and shrivel up. This is followed by discoloration and collapse of the stem. If a stem is split down at this stage, brown streaks, corresponding



Black Scab.

to the position of the vascular bundles, will be seen. These brown streaks are the vessels crowded with bacteria, which gradually descend the stem and finally pass into the tubers, where they first manifest their presence by a more or less interrupted pale brown zone, situated some little distance from the outside of the potato. This zone corresponds to the position of the vascular bundles in the tuber. As the bacteria multiply the coloured zone becomes darker, and finally blackish, at the same time extending towards the centre of the tuber, which eventually becomes rotten, the skin alone resisting the disintegrating action of the bacterium.

According to Dr. E. F. Smith, infection usually takes place through the leaves or stem, the parasite gradually working downwards until it reaches the underground tubers. Furthermore, minute insects of various kinds are supposed to be the main agents in causing a widespread epidemic, by alternately feeding on diseased and healthy plants. It is probable that underground infection may also occur from bacteria present in the soil.

Tomatoes and egg-plants also suffer severely from this disease in the United States.

Preventive Measures.

The important point to attend to is the destruction of insects that feed on the leaves of the potato. This can be accomplished by spraying with Bordeaux mixture to which an insecticide has been added.

If potatoes are dug as soon as the disease is indicated by the wilting of the leaves, a considerable portion of the crop may be saved by storing the tubers in a cool dry place. If allowed to remain in the ground, not only do the tubers become rotten but the soil is also badly infected.

Potatoes or tomatoes should not be planted in soil that has produced a diseased crop, nor should potatoes from a diseased area be used for "sets."

Fuller details of the bacterium, and of the wholesale destruction caused by its presence in the United States, will be found in "A Bacterial Disease of the Tomato, Egg-plant,

and Irish Potato," by Erwin F. Smith. U.S. Dept. Agric. Bull. No. 12 (1896).

Description of Figures (Plate II.).

1. Section of a potato showing the entrance of the bacterium into the tuber through its underground stem. The discoloured zone is small and indicates a quite recent attack.

2. Section of a potato showing the disease in an advanced stage.

III.—SCLEROTIUM DISEASE OF POTATOES.

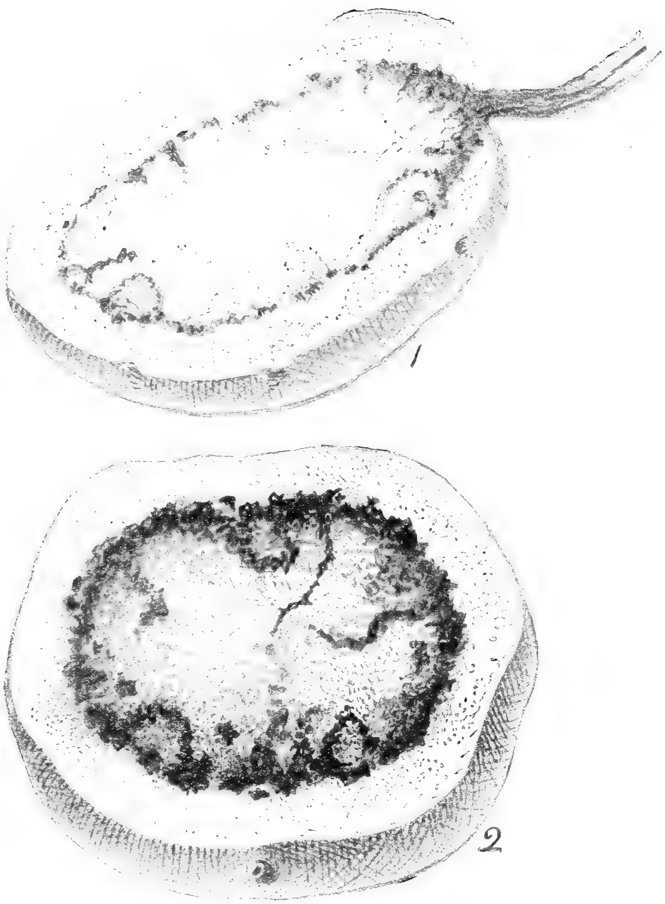
Sclerotinia sclerotiorum (Massee).

In this instance the tubers are not directly attacked by the fungus, but their growth is either checked or entirely arrested, owing to the destruction of the leaves of the plant.

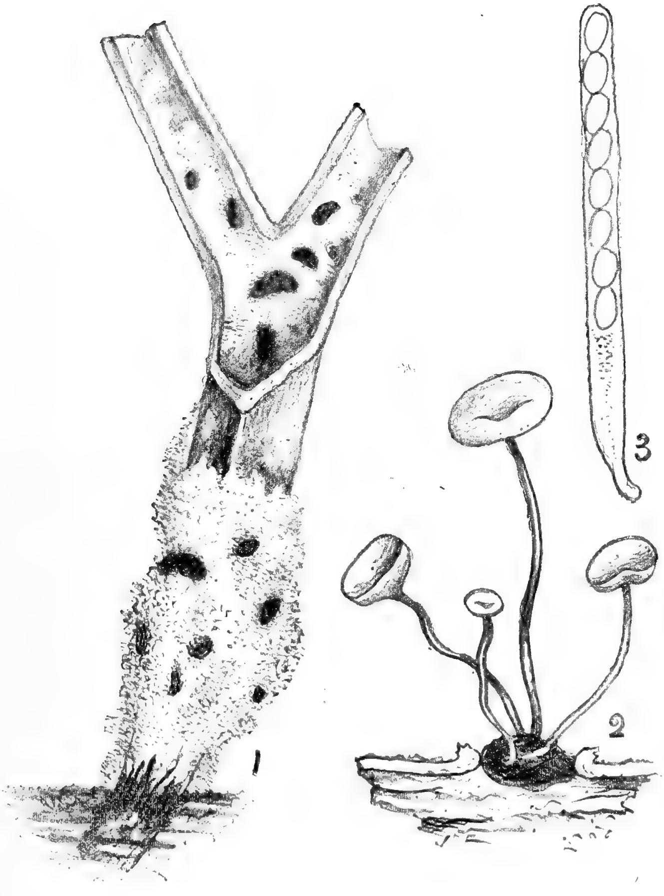
The base of the stem just above the ground-line becomes covered with a white fluffy substance, the mycelium of the fungus. This mould gradually grows up the outside of the stem if the atmosphere remains moist and the temperature sufficiently high. After some time the fluffy mould collapses and becomes more compact, and bears numerous variously-shaped black bodies, which sometimes attain the size of a grain of wheat, imbedded in its substance. These bodies, which consist of densely compacted fungus spawn, are called sclerotia. During this period of the development of the fungus the potato stem has become limp and the leaves wilted, and both perish early in the season.

When the weather is dry and warm, the mycelium extends most vigorously in the hollow of the stem, where numerous sclerotia are formed, very little fluffy mycelium appearing on the surface of the stem.

Collecting and burning diseased plants is the only certain method of stamping out the disease. If infested tops are left on the ground to decay, the sclerotia remain in the ground until the following season, when they form reproductive bodies that bear spores which infect the growing crop. In addition to the potato, beans, peas, cucumbers, marrows, turnips, &c., are also attacked; in fact, probably, every kind of cultivated plant,



BACTERIOSIS OF POTATOES.



Sclerotium Disease of Potatoes.

and also many weeds, are susceptible to the attacks of this fungus.

Placing diseased portions of plants on the manure-heap or in the piggery simply favours the continuation and spread of the fungus, as the sclerotia remain active and vigorous when the plant in which they originated is thoroughly decayed. The sclerotia pass, without suffering injury, through the intestinal canal of an animal. Hence, in all such cases, the sclerotia are eventually returned to the land, where they produce fruit and infect fresh crops.

Gas-lime or quicklime should be applied to land where the disease has existed. Potatoes for "sets" should be procured if possible from districts free from the disease.

The fungus causing rottenness of turnips and swedes, described in this *Journal* (III., p. 120), also the potato disease in Ireland called "Yellow blight," appear to be closely related to the present disease, differing more especially in having a Botrytis form of fruit.

For information as to the life-history of the fungus consult:

Smith, W. G., Diseases of Field and Garden Crops, p. 125.
De Bary, A.; in Bot. Zeit. p. 485 (1886).
Humphrey, T.; in Bull. Agric. Exper. Station, Mass., 1892.

Description of Figures (Plate III.).

1. Portion of a potato haulm showing a dense white felt of mycelium, with sclerotia covering the surface just above the ground-line. Higher up mycelium and sclerotia are seen in the interior of the haulm. Nat. size.

2. A sclerotium that remained on the ground throughout the winter attached to a decayed fragment of potato haulm. During the following summer it produced four long-stalked ascigerous fruits. × 2.

3. An ascus containing ripe spores, borne by the ascigerous fruit. × 300.

BUTTER RECORD OF THE BUCKHOLD HERD FOR THE YEAR OCTOBER 1ST, 1901, TO SEPTEMBER 30TH, 1902.

In the following paper two distinct records are given: A, shewing the total amount of butter made in the year and the average per cow for the year; and B, shewing the individual record of every cow during the year. Both records take account of all cows that have been in the herd, whether for part or for the whole of the year. All cattle six days after the birth of their first calf, whether the calf is premature or otherwise, are counted as cows in the herd so long as they remain at Buckhold.

Record A.

The annual record A (p. 316) is obtained by adding together three items: (1) the amount of butter that has been made in the year, this amount being taken from the butter sale book; (2) the amount of butter contained in the milk and cream that was used at the house or farm, this being calculated by the Gerber butyrometer*; (3) the amount of butter given by the cows when away from home at the shows, this being arrived at by calculation.

It will be seen that the average amount of butter made by the herd in the year is at the rate of $451\frac{1}{10}$ lb. per cow, and that the average for the cows that were in the herd all the year is $450\frac{4}{5}$ lb. per cow.

To find the average number of cows that have been in the herd during the year, it will be necessary to take account of

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* Of course, strictly speaking, no butter is contained in the milk or cream, only butter-fat. By means of the Gerber chemical test the proportion of butter-fat in any milk can be quickly arrived at. It has been estimated that in 100 lb. of butter there should be 12 lb. of water and 88 lb. of butter-fat. If, therefore, the proportion of butter-fat in any given weight of milk or cream is known, the amount of butter which could be made from that milk or cream can be estimated. For convenience in this paper "milk containing so much butter" and "cows giving so much butter" will be written.

animals that have come into the herd as cows (by having their first calf or by purchase) or have left the herd (by sale or by being killed). It will be clear that if two cows were in the herd each for half a year, they must be reckoned as one cow for a year, as they would, under ordinary circumstances, give the milk that would be given by one cow, and require the food that would be required by one cow, during a year's time. Again, if twelve cows were in the herd only one month each they would also have to be reckoned for profit or expense as one cow, *i.e.*, one cow for one year must be taken as the unit.

On page 319 it will be seen that seventeen cows have been in the herd part of the year, and column XVI. on that page shews the different parts of the year that each cow was in the herd; these amount in all to 1,787 days, *i.e.*, the seventeen cows are equal to one cow in the herd for 1,787 days, and if the days are divided by 365 the equivalent value of these cows will be found, amounting to 4·89 cows for a whole year.

The question may be asked: As the average of the whole herd is very nearly the same as the average of the cows that have been in the herd all the year, why is there need in the records to give anything further than the latter average? This is the usual course in a milk record, it is easier to understand, and prevents complications of figures?

One answer is that then no guide would be given to the profit or loss in that which is usually the weaker and inferior part of the herd. That unless all the animals come into the record there is a tendency by want of attention to keep cattle that should be killed; these cows not of the right stamp are allowed to remain and breed, and thus to lower the standard of the whole herd.

A second answer is that no better proof of the butter-making qualities of a herd can be given than the evidence of the butter sale book (always supposing that the butter is such as it ought to be), and this book of necessity includes the butter of every cow in the herd during the year.

Record B.

This record (pp. 318, 319) gives the individual record of every cow. It will be seen that one animal has made over 600 lb.

of butter in the year, and that only one of those that have been in the herd for the whole year has made less than 300 lb. of butter.

This record B is made in the following way:—In the middle of each month (see the specimen sheet for December, 1901, on p. 317), the milk of every cow is weighed at two milkings (on one night and on the succeeding morning); these two weights added together give the amount in column I. Further, at each of these two milkings a sample of each cow's milk is taken in the proportion of 1 drachm for every 1 lb. of milk; the samples of the night and of the morning's milk of each cow are mixed together, this mixed sample is warmed and tested by Gerber's butyrometer, and thus the average proportion of butter-fat in the milk of each cow for the two milkings is ascertained (column II.). As the weight of the milk and the proportion of butter-fat for each cow is known, the amount of butter which each cow has given during the twenty-four hours can be recorded (column III.). The total of column III. gives the amount of butter made by the herd during that time. This total is checked thus: The milk of the two milkings is passed through a cream separator (except certain measured amounts which are sent to the house or used at the farm), the cream is churned, and the butter recorded (*d*), and further, by the Gerber test, the amount of butter contained in the measured milk and cream not churned and sent to the house is found (*e*). These two items, (*d*) and (*e*), should make a total equal to the total of column III.

This column III. would be sufficiently correct as an average daily record for the month if all the cows were giving milk all the month, but as some of them may be dry part of the time or may be leaving or entering the herd, another column (IV.) is given to meet such cases, due allowance being made in it for the time each of the animals is in milk during the month; therefore column IV. gives the average daily record of each animal for the month.

Columns I. to XII. (pp. 318, 319) give in exactly the same way each cow's average daily record for each of the twelve months, and if these items are added horizontally column XIII. gives the additions of these twelve columns. The amounts so obtained, if multiplied by thirty (the approximate number of

days in a month), give the individual butter record of each cow for the year as obtained by this method (see column XIV.); and the total at the foot of that column gives the yearly butter record of the herd as obtained by this method, *i.e.*, 14,838 lb.

Reasons for deciding which of the two Records, A or B, is the more reliable.

The record B does not always agree quite accurately with the record A. One reason is that the former record entirely depends on the chemical test (it is, however, checked each month by the churn), whereas the record A depends principally on the churn; and churning, however carefully it may be carried out, is liable to slight errors. Thus, on one day a little more than 12 per cent. of water, and on other days a little less, may be included in the butter. For this reason the chemical test would seem to be the more exact, as butter-fat is a very nearly constant substance, while butter, even in the hands of the very best dairymen, varies slightly from day to day. But there is another reason why the two accounts do not completely agree, namely, that the chemical test is taken only on one day in the month, while the churning takes place here on all week days; and it may be that the day of the chemical test is a little unfavourable, as would happen if it were taken on a very hot day in summer or on a very cold day in winter, or opposite conditions might prevail, and the test be too favourable. It will further be noticed that as the chemical test is reckoned for only 360 days (30×12) the result is about $1\frac{1}{4}$ per cent. too low.

The question then arises, as these two records check one another and yet do not quite coincide, which of them should be considered to be the more reliable? The record A has been taken as the standard as being probably more exact than the other for the reasons given above, and also because in general there is greater confidence in results obtained by the churn than in those obtained by a chemical test. It has been our custom to add to the record B or to subtract from it until it is nearly equal to the record A, and this is the reason for the addition of 3 per cent. to the individual records in column XV. on pp. 318, 319. It may be mentioned that no greater difference than 3 per cent. between the two records has arisen in the last six years. The

figures which accompany this paper were made for me by my bailiff, Mr. John Cox, after the original plan drawn up here. The close results of the churning and the chemical tests are complete evidence of the care he has shown in the working of the Gerber test and of his skilful superintendence of all the churning operations.

HERBERT WATNEY.

Record A.

Butter made during the year, taken from the farm butter sale book	13,567 lb.
Butter contained in 8,973 quarts of milk and 908 quarts of cream used at the house or at the farm for calves, &c. ...	1,580 ,,
Probable amount of butter made by cows when travelling to or from and during their stay at the public shows ...	141 ,,
	15,288 ,,

There were 29 cows in the herd during the whole year and 17 cows in the herd for different parts of the year; these parts of the year when added together make a total of 1,787 days; thus the 17 cows for parts of the year are equal to 4·89 cows for a whole year. There were, therefore, an average number of 33·89 cows in the herd all the year, and these give an average of $451\frac{1}{10}$ lb. of butter per cow per year.

By means of record B we can apportion the number 15,288, between the 29 cows and the 17 cows.

The 29 cows that were in the herd the whole year gave 13,074 lb. of butter, or an average of $450\frac{4}{5}$ lb. of butter per cow per year.

The 17 cows that were in the herd only for parts of the year gave 2,214 lb. of butter; and if reckoned as 4·89 cows, have an average at the rate of $452\frac{7}{10}$ lb. of butter per cow per year.

SPECIMEN PAGE FOR RECORD B.
Day's Milk and Butter Record for December, 1901.

No.	Cow's Name.	I. Lb. of Milk.	II. Percentage of Fat.	III. Equivalent to lb. of Butter.	——	IV. Daily Average for Month in lb. of Butter.
1	Lady Sabean ...	...	...	...	In Milk 6 days $\frac{6}{30}$ Nov. Test ·24 ...	·05
2	Marryatt's Lassie ...	10	6·6	·75	... ...	·75
3	Syndic's Thorn II....	...	...	...	In Milk 6 days $\frac{6}{30}$ Nov. Test 1·07...	·21
4	Gamboge's Pride II.	10¾	7·2	·88	In Milk 27 days $\frac{27}{30}$	·79
5	Sharab	21¼	7·4	1·83	... ...	1·83
6	Aurelius's Shrub ...	19¼	5·7	1·25	... ...	1·25
7	Lady Siphon ...	15¼	6·0	1·04	... ...	1·04
8	Lady Sheila ...	16½	6·4	1·20	... ...	1·20
9	Lady of Sunny Isles	18¼	6·4	1·33	... ...	1·33
10	Oompah's Boss Girl	23	4·2	1·10	... ...	1·10
11	Red Thorn II. ...	12½	5·5	·78	... ...	·78
12	Aurelius's Thorn ...	21	5·8	1·39	... ...	1·39
13	Queen Bess... ...	25½	4·7	1·36	... ...	1·36
14	Guenon's Lady Teasel...	23	5·7	1·49	... ...	1·49
15	Wild Thorn III. ...	19	6·3	1·36	... ...	1·36
16	Lady Teasel ..	19½	5·0	1·11	... ...	1·11
17	Guenon's Fancy ...	19½	6·0	1·33	... ...	1·33
18	Fancy's Pride II. ...	17½	5·8	1·15	... ...	1·15
19	Sundew IV.... ...	18¼	5·9	1·23	... ...	1·23
20	Sherbet	21½	5·1	1·25	... ...	1·25
21	Sophie's Lass ...	20¼	5 4	1·24	... ...	1·24
22	Guenon's Lady ...	21¼	5·8	1·40	... ...	1·40
23	,, Bess ...	20½	5·1	1·19	... ...	1·19
24	,, Maple ...	20	5·4	1·23	... ...	1·23
25	Lavanja	28	5·3	1·69	In Milk 21 days $\frac{21}{30}$	1·18
26	Lady Opale... ...	26	4·3	1·27	In Milk 26 days $\frac{26}{30}$	1·10
27	Bluebell	...	...	...	In Milk 4 days $\frac{4}{30}$ Jan. Test 2·33...	·31
28	Syndic's Sherbet ...	16¼	5·5	1·02	... ...	1·02
29	Marryatt's Lass		Dry			
30	Red Maple		Dry			
31	Wild Thorn II.		Dry			
32	Shrub		Dry			
33	Sabean II.		Dry			
				30·87		30·67

RECORD checked thus:

		lbs.	
Butter made		27	(d)
½ Pint Cream		·24	(e)
New Milk used	lbs....		
House... ...	... 38½		
J. C.	... 5		
	*43½ at 6·0%	2·99	
		30·23	

Cows in milk only part of the month—If a cow is in milk for 21 days, she is credited with $\frac{21}{30}$ of the figure standing opposite her name in column III., see cow No. 25. If there is no figure opposite her name in column III. she was not in milk on the day when the test was taken—she is then credited with the proportion of the test of the preceding or succeeding month according as she was in milk at the beginning or end of the month, see cows No. 1 and No. 27. As the figures at the end of the year are multiplied by 30, the fractions are taken as 30ths, not 31ths.

* This amount, 43½ lb. of milk (not churned but used as new milk) is considerably smaller than usual—as no new milk was required for calves during this month.

The figures in column III. can be obtained in one of two ways, by a ready reckoner (which, however, is liable to small errors); or by multiplying the lb. of milk in column I. by the percentage of butter-fat (column II.) to get the weight of butter-fat, and multiplying this latter by $\frac{100}{88}$. As butter is estimated to contain 88 lb. of butter-fat and 12 lb. of water, the butter is $\frac{100}{88}$ of the butter-fat. For example, the butter yielded by cow No. 4, Gamboge's Pride II., is found as follows:—

$$10{\cdot}75 \text{ lb. of milk} \times \frac{7{\cdot}2}{100} = {\cdot}774 \text{ lb. of butter-fat}$$
$$\text{and } {\cdot}774 \text{ lb. of butter-fat} \times \frac{100}{88} = {\cdot}88 \text{ lb. of butter, or } {\cdot}8{,}795$$

RECORD B.—RECORD OF THE HERD FROM OCTOBER 1ST, 1901, TO SEPTEMBER 30TH, 1902.
Average daily Record of Cows for each of the 12 months.

No.	Cows.	I. Oct.	II. Nov.	III. Dec.	IV. Jan.	V. Feb.	VI. Mar.	VII. April	VIII. May	IX. June	X. July	XI. Aug.	XII. Sept.	XIII. Total of Cols. I to XII	XIV. Column XIII × by 30.	XV. 3 per cent. added to equa'ise to Record A.	XVI. Time in Herd.
29 Cows in the herd all the year.																	These 29 Cows in the herd all the year.
1	Sharab	1·65	1·71	1·83	1·55	·70	...	1·89	2·61	2·06	2·08	1·93	1·88	19·89	596·70	614·60	
2	Marryatt's Lass... ...	1·62	·94	...	·52	1·74	1·96	1·92	2·10	2·11	1·71	1·69	1·71	18·02	540·60	556·81	
3	Lady of the Sunny Isles	·98	1·70	1·33	·87	1·42	1·64	1·82	1·90	1·68	1·51	1·80	1·30	17·95	538·50	554·65	
4	Guenon's Lady Teasel...	1·37	1·44	1·49	1·33	1·25	1·02	1·41	1·74	1·39	1·58	1·38	1·42	16·82	504·60	519·73	
5	Red Maple	1·01	·23	...	1·65	1·76	1·91	1·93	1·93	1·44	1·87	1·66	1·30	16·69	500·70	515·72	
6	Syndic's Thorn II. ...	1·23	1·07	·21	·29	2·20	1·87	1·75	1·94	1·54	1·52	1·47	1·43	16·52	495·60	510·46	
7	Bluebell	·39	·09	·31	2·33	1·87	1·97	2·18	2·16	1·53	1·69	·76	·90	16·18	485·40	499·96	
8	Aurelius's Shrub ..	1·49	1·39	1·25	1·23	1·09	...	·43	1·95	1·97	1·54	1·47	1·59	15·40	462·00	475·86	
9	Queen Bess	1·49	1·46	1·36	1·37	1·19	1·13	·28	...	1·30	2·28	1·86	1·59	15·31	459·30	473·07	
10	Aurelius's Thorn ...	1·45	1·43	1·39	1·12	1·08	1·17	·58	...	1·45	1·60	2·49	1·51	15·27	458·10	471·84	
11	Lavanja	·36	...	1·18	1·36	1·44	1·44	1·56	1·65	1·69	1·60	1·52	1·44	15·24	457·20	470·91	
12	Guenon's Fancy ...	1·40	1·28	1·33	1·10	1·11	1·21	·95	1·30	1·40	1·49	1·15	1·18	14·90	447·00	460·41	
13	Sabean II.	1·12	1·28	...	...	...	1·52	1·76	2·05	1·58	1·85	1·77	1·75	14·68	440·40	453·61	
14	Wild Thorn II.... ...	1·11	·55	...	1·48	1·47	1·32	1·57	1·54	1·37	1·43	1·41	1·35	14·60	438·00	451·14	
15	Gamboge's Pride II. ..	1·31	1·22	·79	...	·60	1·64	1·70	1·71	1·53	1·27	1·39	1·38	14·54	436·20	449·28	
16	Lady Teasel	1·12	1·27	1·11	1·23	1·10	1·05	...	·71	2·08	1·52	1·52	1·65	14·36	430·80	443·72	
17	Wild Thorn III.... ...	1·37	1·21	1·36	1·10	1·09	1·10	·70	1·49	1·21	1·33	1·13	1·19	14·28	428·40	441·25	
18	Lady Siphon	1·28	1·12	1·04	·63	...	1·16	2·06	1·67	1·47	1·29	1·26	1·29	14·27	428·10	440·94	
19	Guenon's Lady	1·44	1·36	1·40	1·33	1·13	1·25	1·41	1·33	1·25	...	·55	1·69	14·14	424·20	436·92	
20	Marryatt's Lassie ...	·97	·87	·75	...	·42	1·81	1·73	1·73	1·56	1·39	1·37	1·40	14·00	420·00	432·60	
21	Lady Sheila	1·26	1·15	1·20	·88	·29	...	1·54	1·89	1·52	1·29	1·45	1·33	13·80	414·00	426·42	
22	Guenon's Bess	1·23	1·24	1·19	1·28	1·09	1·24	1·24	1·12	1·33	·97	1·08	·36	13·37	401·10	413·13	
23	Sophie's Lass	1·44	1·46	1·24	1·16	1·02	1·22	1·15	1·10	·22	·30	1·49	1·30	13·10	393·00	404·79	
24	Shrub	·77	·38	...	1·42	1·30	1·52	1·59	1·53	1·28	·95	·98	1·19	12·91	387·30	398·91	
25	Oompah's Boss Girl ...	1·27	1·16	1·10	1·07	·82	...	...	1·49	1·32	1·32	1·29	1·46	12·30	369·00	380·07	
26	Lady Sabean	·71	·24	·05	·37	1·58	1·82	1·56	1·60	1·30	1·01	·81	1·10	12·15	364·50	375·43	
27	Sundew IV.	1·18	1·69	1·23	1·23	1·27	1·23	1·12	1·25	·91	·15	...	·88	12·14	364·20	375·12	
28	Syndic's Sherbet ...	1·09	1·03	1·02	·90	·85	·97	·98	·85	·16	...	1·01	1·70	10·56	316·80	326·30	
29	Red Thorn II.	·83	·87	·78	·70	·72	·77	·10	·35	1·32	1·03	1·04	1·10	9·61	288·30	296·94	
	Carried forward ...	33·94	30·84	25 94	29·50	31·60	34·94	36·91	42·69	40·97	37·57	38·73	39·37	423·00	12,690·00	13,070·59	

RECORD B (*continued*).—RECORD OF THE HERD FROM OCTOBER 1ST, 1901, TO SEPTEMBER 30TH, 1902.
Average daily Record of Cows for each of the 12 months.

17 Cows in the herd part of the year.

No.	Cows.	I. Oct.	II. Nov.	III. Dec.	IV. Jan.	V. Feb.	VI. Mar.	VII. April	VIII. May	IX. June	X. July	XI. Aug.	XII. Sept.	XIII. Total of Cols. I to XII	XIV. Column XIII × by 30.	XV. 3 per cent added to equalise to Record A.	XVI. Days in Herd.
	Brought forward ...	33·94	30·84	25·94	29·50	31·60	34·94	36·91	42·69	40·97	37·57	38·73	39·37	423·00	12,690·00	13,070·59	
30	Lady Opale	·65	·32	1·10	1·33	1·29	1·45	1·21	1·26	1·07	·80	...	...	10·48	314·40	323·83	293
31	Guenon's Maple ...	...	·93	1·23	1·15	·94	·97	1·01	·91	·93	...	...	...	8·07	242·10	249·36	235
32	Wild Teasel III. ...	..	...	...	...	·06	1·70	1·79	1·79	1·30	1·67	1·49	1·49	11·29	338·70	348·86	215
33	Sherbet	1·50	1·36	1·25	1·28	1·07	·64	...	...	...	...	...	...	7·10	213·00	219·39	168
34	Fancy's Pride II. ...	1·10	1·16	1·15	·99	·99	·59	...	...	...	...	...	...	5·98	179·40	184·78	168
35	Vervain's Sundew ...	...	...	...	...	...	...	...	1·18	1·41	1·31	1·07	1·38	6·35	190·50	196·21	150
36	Fancy's Pride III. ...	...	...	...	...	...	...	...	...	1·27	1·58	1·11	1·11	5·07	152·10	156·66	118
37	Guenon's Thorn	...	...	...	...	...	...	...	...	·19	1·16	1·04	1·07	3·46	103·80	106·91	98
38	Guenon's Lavanja ...	...	...	...	...	...	...	...	...	·23	1·74	1·32	1·40	4·69	140·70	144·92	97
39	Wild Thorn IV.... ..	...	...	...	...	...	...	...	..	...	·83	·69	·20	1·72	51·60	53·14	65
40	Blackberry	...	...	...	...	...	...	...	...	...	...	·64	1·33	1·97	59·10	60·87	50
41	Dewberry...	...	...	...	...	...	...	...	...	...	...	·67	1·96	2·63	78·90	81·26	50
42	Guenon's Sophie ...	·91	...	...	...	...	...	...	...	...	...	...	...	·91	27·30	28·11	34
43	Lady Sherbet II. ..	60	...	...	...	...	...	...	...	...	...	...	...	·60	18·00	18·54	22
44	Violette	...	...	...	...	...	...	...	...	...	...	...	·87	·87	26·10	26·88	16
45	Opale	·26	...	...	...	...	...	...	...	...	...	...	...	·26	7·80	8·03	4
46	Queen Bessie	·18	...	...	...	...	...	...	...	...	...	...	...	·18	5·40	5·56	4
	Totals... ...	39·14	34·61	30·67	34·25	35·95	40·29	40·92	47·83	47·37	46·66	46·76	50·18	494·63	14,838·90	15,283·90	1,787
																	Total days of Cows in Herd part of year.

(30) Left herd July 21st.
(31) Entered Nov. 7th ; Left herd June 30th.
(32) Entered February 28th.
(33) Left herd March 18th.
(34) Left herd March 18th.
(35) Entered May 4th.
(36) Entered June 5th.
(37) Entered June 25th.
(38) Entered June 26th.
(39) Entered July 6th ; Left herd Sept. 9th.
(40) Bought August 12th.
(41) Bought August 12th.
(42) Left herd November 4th.
(43) Left herd October 23rd.
(44) Bought September 15th.
(45) Left herd October 5th.
(46) Left herd October 5th.

A NEW POTATO DISEASE.

(Chrysophlyctis endobiotica.)

In the autumn of 1900 my attention was drawn to some potatoes presenting a very curiously diseased appearance. At one end were large, irregular tumour-like swellings, very much convoluted, but otherwise not unlike the too-well-known excrescences of the turnip known as "finger-and-toe," or perhaps more especially that form described as "club" or "anbury."

These excrescences of the potato-tuber consist of masses of thin-walled parenchymatous cells, very rich in starch. At the periphery of the outgrowths were numerous large, spherical or ellipsoidal resting-spores, measuring $70\mu \times 50\mu$, of a deep brown colour and without any lateral depression (Plate IV., Fig. 3). These spores were always found to be present in great numbers and apparently belonged to some parasite, which set up an irritation stimulating the cells to excessive cell-division and thereby producing the protuberances above described.

Attempts made to induce these spores to germinate always failed. They were sown in a hanging drop and also upon quite small potato-shoots, under varying conditions and temperatures, but hitherto without success. I have, however, been able to infect sound potatoes and exactly reproduce the disease by inoculating the soil with these spores.

In the spring, three large flower-pots filled with ordinary garden soil were sunk up to the edge in the earth, in the College garden, and potatoes planted in them; in two of the pots some of these spores were sown in the soil, while the third pot served as a control. The spores had been kept dry in the laboratory during the winter.

In the control pot the potatoes grown during the summer were perfectly normal. The soil was evidently quite sterile to this parasite, the disease never having been known in this

locality. In the inoculated pots the potatoes were very different; some in each pot were badly deformed and exhibited the disease in a most pronounced form. Figure 1 is a photograph of tubers grown in the experimental pots: A one from the control pot, B and C from the inoculated pots.

These pots were allowed to remain, with the same soil, undisturbed until the next spring, when a second time potatoes were planted in them, without the admixture of any fresh spores. Those in the control pot produced normal, healthy tubers; while in the others the tumorous excrescences were again developed, and microscopical examination revealed the presence of the characteristic spores observed in the original diseased specimens.

The parasite can thus be propagated by means of spores in the soil and, when once it has been established, can maintain itself over the winter and infect the crop in succeeding years.

Judging from some sections in an early stage, the attack appears to commence at the "eyes," the parasite easily gaining an entrance into the outer cells of the young and tender structures which normally would develop into leaves. In these the cells are readily stimulated to divide, and, as a result of the injury caused by the parasitic invasion, irregular cell-division is set up. The destruction of any one cell causes those in contact with it to divide in the attempt to heal the wound; when these latter cells are attacked in their turn, a further cell-division is induced, and by a repetition of the process the leaf-protuberances become converted into an irregular cell-mass which in the initial stages may be seen as finger-like outgrowths (Fig. 2). From these points the irritation spreads along the cork-cambium, so that the cells over a large portion of the surface of the potato gradually undergo this irregular division and multiplication, which is extended also into the internal tissues.

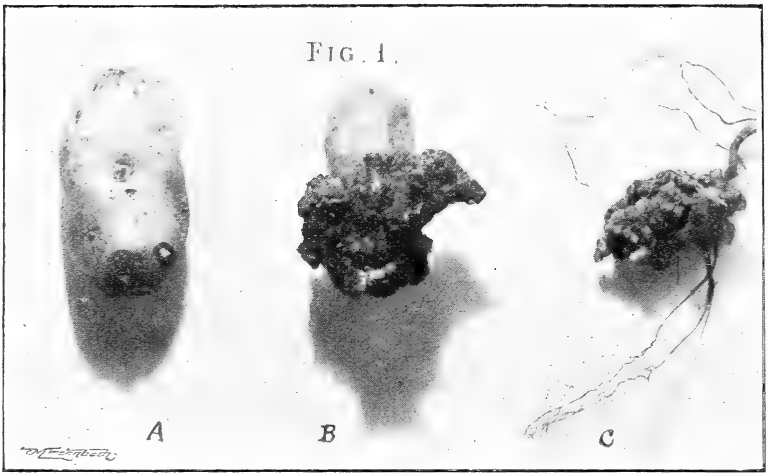
The parasite can be seen in the diseased tissues as a globular protoplasmic mass (plasmodium), destitute of cell-wall and without any trace of mycelium. It draws its nourishment from the host-cell and consumes the protoplasm and almost the entire cell-contents, leaving only a brown cell-wall. The plasmodium divides, part passing through the cell-wall into the adjacent cells, and in this way the disease spreads through the tuber. On

the approach of autumn each plasmodium is surrounded by a very hard and firm, brown cell-wall and forms a resting-spore (Fig. 3). The resting-spores are most frequently found in the external layer of cells, but in many cases may be observed many layers deep in the tissues.

This potato disease is apparently the same as that which has been noted by Schilberszky,* from Upper Hungary. He describes potatoes with dark-coloured pustules, irregularly grouped and crowded together, forming wart-like outgrowths, and with a parasitic organism present in the periderm. This fungus belongs to the order *Chytridineæ*, and has been named by Schilberszky *Chrysophlyctis endobiotica*. He distinguishes two kinds of reproductive cells, swarm-sporangia and resting-sporangia. The swarm-sporangia are of a yellow-brown colour, and are generally found in the sub-epidermal cells, sometimes two or three in one cell. On germination they give rise to small spherical swarm-spores, which penetrate the walls of the neighbouring cells and so spread the disease. The germination of the resting-sporangia has not been observed. The internal progress of the disease is indicated by a distinct brown colouring of the tissues, which change of colour affects the whole of the protoplasm, with the exception of the starch-grains, as well as the shrunken cell-wall. Schilberszky considers that this parasite bores its way through the cell-wall and does not enter the plant through a wound.

At present the disease has only been reported to me from Cheshire, and possibly it may have escaped notice in other localities. How it has been introduced into England I have not been able to ascertain, but, from my observations, it is evidently a very destructive parasite, which possesses most effective means of spreading itself if only opportunity offers. As, so far, it appears to be of local occurrence, it is of the highest importance to stamp it out before it obtains a firm foothold in this country. This might be done by carefully sorting the potatoes and destroying those attacked. These should in no case be allowed to pass out of an infected district or be used for "seed." It is

* "Ein neuer Schorfparasit der Kartoffelknollen." Berichte d. Deut. Bot. Gesell. Bd. XIV., 1896.



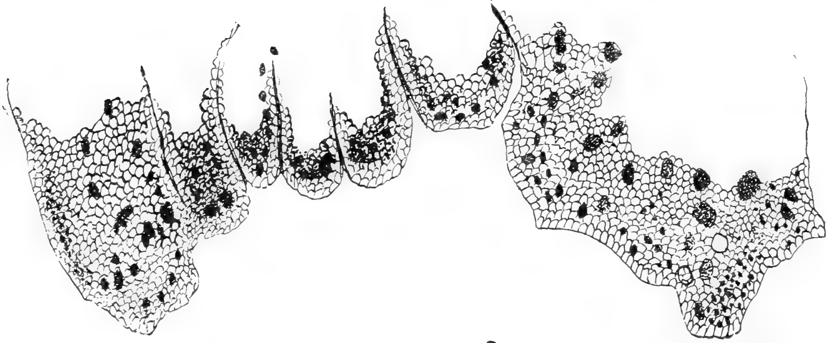
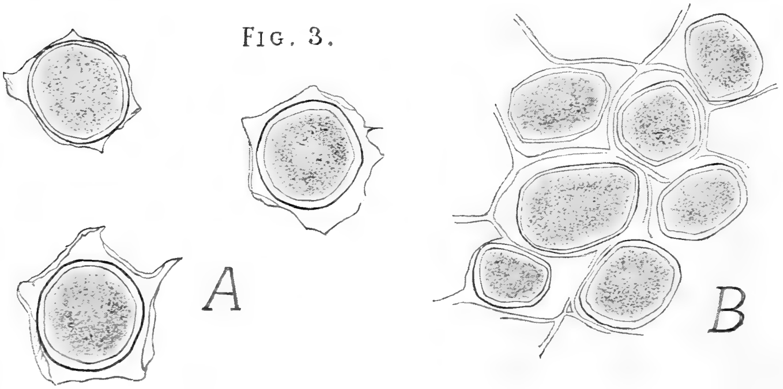


FIG 2



A DISEASE OF POTATOES (*Chrysophlyctis endobiotica*).

worth taking every possible precaution to check this parasite, which otherwise might ensure for itself a wide distribution and cause very considerable damage.

M. C. Potter.

Description of Figures (Plate IV.).

Fig. 1. Photograph of potatoes from experimental pots: A normal tuber, from control pot, grown in uninfected soil; B and C, tubers grown in soil sown with *Ch. endobiotica.*

Fig. 2. Section through an "eye" of a potato, showing the abnormal development of the leaf-primordia. The dark spots indicate the parasite in the tissues.

Fig. 3. Resting-spores: A, when ripe and detached; B, in the cells of the host.

SOME ENGLISH CO-OPERATIVE AGRICULTURAL SOCIETIES AT WORK.

One of the first co-operative trading associations formed in England as the result of the propagandist work of the British Agricultural Organisation Society was the Co-operative Agricultural Society at Muskham, a small village in Nottinghamshire. It received its certificate of registration on May 1st, 1899, The shares are of the value of 5s., with 1s. 3d. called up. For the first few months the membership consisted of only the seven members and the secretary, who signed the rules, which is the number required under the Industrial and Provident Societies Act before the Chief Registrar can consider the application for registration. At the end of a few months only one additional member was enrolled, and by very slow degrees was the membership increased. The present number of members is 47. The object of the society was primarily to purchase in bulk goods required by the members. An early endeavour was made by the secretary to secure quotations from local and other manufacturers for these requirements, and although at first many difficulties were experienced, these have gradually been more or less overcome.

Just previous to the beginning of harvest in 1899 a suggestion was made by some of the members that a "reaper and binder" should be purchased for the use of the society. At first the proposal did not find favour, especially as the paid-up capital of the society did not exceed £15, but a special meeting was called to consider the question, and after some discussion it was decided to appoint a sub-committee to inspect an American machine. The sub-committee, after making an inspection, decided to recommend the purchase of the machine provided a sufficient guarantee were given with it. The general committee ratified the recommendations of the sub-committee. The price asked was £32, less discount. To raise this money a form of guarantee supplied by the society's bankers was drawn up

whereby each and all of the seven members became security in the sum required for the purchase.

It was thus the Muskham Society became the possessors of their first "reaper and binder."

The following regulations were drafted by the committee as to the working of the machine :—

(1) That one of the members be placed in charge of the machine, with a remuneration at the rate of sixpence per acre cut. (2) The charge for use of the machine to members to be 4s. 6d. per acre, twine included. (3) The secretary to have the arranging of how and where the machine was to be worked. (4) Each user of the machine to convey it from the farm where last in use. (5) The last user for the season to take it back to the place where it was to be stored until next season. It may

be stated here that the rates fixed by the committee for members worked out at sixpence per acre less than was charged locally by those who owned machines and hired them out to their neighbours.

This co-operative reaper and binder has this year completed its third season, and the rate to members has been reduced to 4s. 3d. per acre. It paid for itself in two seasons, and is now the property of the society. It is in thorough working order, and the bill for repairs this year did not amount to 1s. 6d. This venture of the Muskham Society has in every way fulfilled expectations, and has been of considerable value to the members.

The society has also been of much benefit to its members in supplying coal at moderate prices. Many of the members are only small farmers, consequently the fact that they are able to reap the advantages of purchase by means of the combined orders of all the members means a considerable saving to them. The society has for some time past been trying to negotiate with the railway company with the object of obtaining permission to store its coal, and other requirements purchased from time to time, on the company's waste land. If the society can obtain this concession its usefulness will be largely increased. More than half the coal delivered in the village is dealt with by the society.

Another movement soon to be inaugurated by this society is the petitioning of the railway company to make the Muskham siding a passenger station, with sidings for loading and unloading live stock, the nearest passenger station being four miles distant.

In the early days of the society it was found that merely to collect requirements and order in bulk did not produce the fullest advantage to the smaller farmer members. A store was taken in the village to get over this difficulty, so that now it is possible for a labourer member to purchase a few stones of maize or feeding stuffs for his poultry or his pigs at the same rate as the larger farmer.

The Muskham Society has done much towards the brightening of rural life. It approached the Technical Education Committee of the Nottingham County Council in 1900, and concluded arrangements for the delivery of lectures on agricultural

subjects. In the following spring arrangements were also made for carrying out experiments to demonstrate the value of various manures on straw and root crops. In the summer of 1901 an excursion was arranged by the society, when over twenty members visited Kingston-on-Soar to inspect the County Council Farm. Much interest was shown by the members in the laboratories, buildings, and the live stock connected with the farm. The visit was thoroughly enjoyed and much valuable information obtained.

The members of the society include men farming 600 acres as well as those farming two or three acres. The list of members also includes farm labourers keeping only a pig or two for breeding purposes. The society has, undoubtedly, been an influence for good, as well as of practical benefit to the members.

It may be of interest to give some particulars setting out the nature and amount of trade done by the society during the past year. The turnover showed a total of £565, the principal items being as follows:—Feeding stuffs, £257; coals, £140; machinery, £121; amount paid in freight to the railway company, £37. The last annual return shows a credit balance of £5.

The item in above statement, "amount paid in freight to the railway company," is of considerable interest, as it shows how important a revenue even small agricultural co-operative societies can yield to the railway companies with the minimum amount of trouble. The railway company, instead of having to deal with thirty or forty individuals, has only to do with the society, and is thus saved much trouble and expense. This applies equally to the merchant who supplies agricultural requirements. The society saves him the bother and risk attached to the keeping of a large number of accounts and the collecting of the monies represented by such. It is, therefore, natural that the society should expect from the railway company the lowest possible freights, and from the merchant or manufacturer the best possible terms.

The agricultural co-operative movement has developed rapidly in Worcestershire. It was only in the autumn of last year that steps were taken to organise a co-operative society at Far Forest. Up to that time, though farmers' clubs

existed in the district, which had attempted to supply a need felt but not expressed, namely, purchase and sale on joint account, no properly directed effort had been made to combine on an organised business basis. The reason was that no one knew how to begin. The Industrial and Provident Societies' Act and its advantages were unknown. The general idea existed that to deal with the question a company formed under the Joint Stock Companies' Act, with considerable capital, would be necessary. When, however, the representatives of the Agricultural Organisation Society were able to show that no such necessity existed, that a society could be registered having every privilege requisite for trading without expense, and that only a small capital was required, since this could always be increased through members joining as the society got better known, the feeling was expressed that it was well worth while to make the attempt to form a society on the lines indicated. "The Forest Supply Association" will always have in the West of England the honour of having led the way in the agricultural co-operative movement. It was no very easy task to induce farmers and small holders to abandon the customs of centuries and buy and sell in common. Yet in a year that has been done at the Forest. The society has made excellent arrangements for the purchase of feeding stuffs of pure quality in sealed bags. The members have soon learnt to appreciate a pure article, and would have been attracted by the quality, even had the price not been reduced. The store-keepers, in their turn, have had to force the millers and dealers who supply them to give them better terms in order to keep some of the trade. Thus even for non-members the gain has been considerable, quality having been improved, and prices reduced from 6d. to 1s. per bag. In poultry, fruit, eggs, &c., the society is a vendor. Its purchases include manures, wire-netting, &c.—indeed, all farmers' requisites. The society owns its own manure drill. To-day the turnover of this society is at the rate of £1,500 a year, and it would not be surprising if next year saw it doubled.

Another interesting society in the same district is the "Vicar's Farm," a dairy established for the purpose of sterilising milk and cream, and for the sale of butter. This enterprise will probably

some day be taken over by the "Forest Supply Association," but the members feel that their society is yet too young to deal with so considerable an enterprise, and, therefore, for the moment the dairy is carried on separately by the "Vicar's Farm," to whom the Vicar of Far Forest has lent the necessary capital on the understanding that the parent association may at any time take over the dairy business at cost price. It was at first no easy task to get the dwellers in Far Forest even to support this venture so far as to supply milk. The upsetting of the whole system of making butter (in some cases good, in the majority bad) was not popular, but in a remarkably short time they have come to see the advantages of selling milk outright at a better price than they could get for their butter, without considering labour, expense of manufacture and cost of marketing. The milk, therefore, which was once obtained with difficulty, is now being offered freely, its acceptance even pressed, and the small holders are already beginning to buy more cows. The sale of the sterilised milk, too, at first offered great difficulty. Though the milk was put up most attractively shopkeepers looked askance at it. Here again, perseverance and energy have triumphed, and the dairy now disposes of as much sterilised milk as it can at present supply. Changes are, however, being made in the organisation of the dairy which will increase its output considerably. Nor should it be forgotten that the "Vicar's Farm" is trying to improve the breeds of poultry. Already, by giving out sittings of eggs, it has enabled every small holding to show fowl runs full of well-bred birds. The people are taking a pride in their produce, their eggs and poultry attract the attention of the neighbours, who in their turn increase and improve their stocks. This may not directly benefit a co-operative society, but it is the result of the co-operative movement—the fulfilment of its mission. There is undoubted truth in the statement that as people begin to adopt new methods they find new requirements. The development which is going on in the Forest has brought with it the knowledge that a water supply is absolutely required. Again co-operation has come in, and it is hoped that water will soon be supplied by the co-operative society which has recently been registered for the purpose. That water is urgently needed will be recognised when I state that people in some cases have

to carry water, even for ordinary household purposes, over a mile, and for drinking purposes even further. The cattle have to be driven long distances to water.

Bewdley, four miles from Far Forest, is the centre of an agricultural district, and there it was felt that some useful work might be done by a co-operative society. The Agricultural Organisation Society chose as its medium the Bewdley Horticultural Society, which has started allotments, exchanges and purchase of seeds, &c. A meeting was held, and a committee appointed to organise the society, which started operations in May last. The society has rented a large warehouse at a moderate rent, where fruit and vegetables are stored, sorted and repacked. In respect to the cherry trade, of which Bewdley is a centre, the society had this year remarkable success in keeping up the price, in spite of adverse market influences, and the growers were saved a loss of about 50 per cent. through the existence of this co-operative society. Again, had it not been for its action, the price of green peas, which were an abundant crop, would have fallen so low that farmers would have had to harvest their peas with the accompanying loss both of money and derangement of crop course. In the case of apples, pears, and plums, this year has been so bad that it cannot be treated as a fair test, but all offered at a fair price by the society have been bought. The question of suitable packages, of grading, and of disposing of the lower grades of fruit, by pulping or otherwise, are all matters that are being studied. In any case, while it may be possible for a co-operative society to deal with these problems, an individual grower, except on the very largest scale, could not tackle it. Vegetables of all sorts, especially potatoes, have been dealt with, and these are now being consigned in large quantities to London, where a really good market has been found. It will take a year or two to get thoroughly organised and equipped so as to cope with the business. There will be disappointments, most probably losses, but what the ultimate result must be is more clearly seen every day, and the strength that is to be gained through co-operation in agriculture is beginning to be accepted as a fact by those who have the intelligence to watch the movement. In another line the Bewdley society has made a new departure. It has established

a co-operative sheep-dipping station. A large "swim bath," a drying floor, suitable pens, &c., are provided. Any member giving one day's notice can drive his sheep there and dip them. The charge is a penny per head. This gives the society a good profit. The farmer makes a saving, his man escapes the risk of blood poisoning, and the sheep, instead of being turned on its back, has a swim of one minute's duration without inconvenience.

Co-operation in Worcestershire is a growing force. Other societies are rapidly forming amongst those who draw their livelihood from the land, namely, the owner, the occupier, and the labourer, the feeling in favour of combination is gaining force, and instead of looking for imaginary remedies, all are beginning to understand that the remedy largely lies in combined action for the common good.

J. NUGENT HARRIS.

BRITISH CROPS OF 1902.

The preliminary statement of the produce of crops in Great Britain, issued by the Board of Agriculture, was in previous years restricted to the returns relating to the three principal cereals—wheat, barley, and oats. For the present year this statement has been extended so as to comprise the figures for all the crops for which estimates of yield are collected. It thus becomes possible to give in this number of the *Journal* the following summary of the results, which has not hitherto been available until three months later :—

Crop.	Yield per Acre.	Above or Below Average.	Crop.	Yield per Acre.	Above or Below Average.
	Bushels.	Bushels.		Tons.	Tons.
Wheat ...	32·83	+ 2·94	Potatoes	5·57	− 0·35
Barley ...	34·82	+ 2·01	Turnips and Swedes	15·02	+ 2·23
Oats ...	42·65	+ 4·39	Mangolds	21·17	+ 3·65
Beans ...	31·37	+ 5·22		Cwts.	Cwts.
			Hay, from clover, &c.	32·53	+ 5·27
Peas ...	28·51	+ 2·88	Hay, from permanent grass	27·17	+ 5·65
			Hops...	6·48	− 2·57

It will be observed that the estimated yield per acre exceeded the average of the preceding ten years in the case of every crop, except potatoes and hops.

The yield per acre of Wheat for Great Britain has in only two previous years (1896 and 1898), since these estimates were first collected, been returned at so high a figure, although the total

produce has frequently, and up to 1893 invariably, exceeded the 56 million bushels now recorded.

Wheat.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years, 1892—1901.
	1902.	1901.	1902.	1901.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
England ...	53,529,442	49,882,667	32·82	30·84	29·86
Wales ...	1,348,064	1,156,673	27·96	24·67	24·33
Scotland ...	1,799,277	1,418,262	38·07	39·15	37·29
Great Britain	56,676,783	52,457,602	32·83	30·84	29·89

The yield of Barley was, for Great Britain, 2 bushels per acre over average, in spite of the fact that on the small Scottish acreage under this crop the yield was returned as slightly less

Barley.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
England ...	54,947,154	49,557,593	34·80	30·30	32·62
Wales ..	3,410,196	3,016,334	33·66	29·60	30·28
Scotland ...	8,137,256	8,533,696	35·52	36·30	35·93
Great Britain	66,494,606	61,107,623	34·82	30·98	32·81

than the decennial average. The lack of quality and condition, of which many complaints are made in the Collectors' reports, and which has to be remembered in connection with all the grain crops of the year, is of especial importance as affecting the marketable value of this crop; although, necessarily, it cannot be taken into account in estimating the yield.

Oats were the most bulky of the three principal corn crops, the estimated yield being nearly $4\frac{1}{2}$ bushels per acre above the average. Here, again, the returns for Scotland tend to reduce

the general average, the yield north of the Tweed, where nearly one-third of the total area under this crop is to be found, being only 1 bushel over average, while in England the excess amounted

Oats.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
England ...	87,065,205	67,863,053	46·00	37·05	39·91
Wales ...	7,681,445	6,490,336	36·55	31·09	33·00
Scotland ...	35,637,032	35,752,141	37·34	37·38	36·41
Great Britain	130,383,682	110,105,530	42·65	36·74	38·26

to 6 bushels per acre. The oat crop of 1902 appears to have been, on the whole, the largest, as regards yield per acre, which has been recorded since these official returns were first collected in 1884.

The Bean crop was estimated to have exceeded the average by rather more than 5 bushels per acre, and was thus relatively

Beans.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
England ...	7,131,349	5,601,920	31·25	23·63	25·81
Wales ...	31,245	26,374	25·57	21·76	23·79
Scotland ...	438,881	438,754	33·99	34·37	32·52
Great Britain	7,601,475	6,067,048	31·37	24·16	26·15

the heaviest grain crop of the year. Only once previously has a better quantitative result per acre been shown.

Peas also show a higher yield per acre than has hitherto been returned, except in one year, although the estimated excess above the average was appreciably less than in the case of

beans. It is to be observed that the pulse crops, as well as the grain crops, exhibit considerably less favourable results in Scotland than in England.

Peas.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
England ...	5,039,552	3,946,977	28·59	26·03	25·69
Wales ...	27,434	30,812	19·94	19·53	19·36
Scotland ...	28,327	28,883	25·94	26·11	24·91
Great Britain	5,095,313	4,006,672	28·51	25·96	25·63

Following upon a year in which the produce was about half a ton per acre above the average, the estimates show that in 1902 the Potato crop in Great Britain was nearly half a ton less than the mean. Here, however, Scotland has an advantage,

Potatoes.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Tons.	Tons.	Tons.	Tons.	Tons.
England	2,225,569	2,627,647	5·39	6·33	6·02
Wales	155,508	182,122	4·95	5·70	5·72
Scotland	813,111	861,481	6·27	6·62	5·67
Great Britain ...	3,194,188	3,671,250	5·57	6·36	5·92

the yield per acre beyond the Border being about half a ton better than the average; while in England it was two-thirds of a ton, and in Wales three-fourths of a ton, less than the decennial mean.

The estimate of 15 tons to the acre for Turnips and Swedes in Great Britain is the best on record, being fractionally larger than that returned for 1886, which has hitherto stood highest. In England, which accounts for two-thirds of the whole

acreage, the yield was $2\frac{3}{4}$ tons above the average, while in Scotland the excess was nearly $\frac{3}{4}$ ton per acre. The steadily declining area under this crop makes the aggregate production,

Turnips and Swedes.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Tons.	Tons.	Tons.	Tons.	Tons.
England ...	16,023,633	12,449,535	14·67	10·88	11·88
Wales ...	1,005,208	946,536	16·50	15·28	14·77
Scotland ...	7,140,609	7,018,110	15·67	15·30	14·95
Great Britain	24,169,450	20,414,181	15·02	12·26	12·79

notwithstanding the high yield per acre, less than in 1897, or than in any year prior to 1896, with the exception of 1885 and 1887.

Mangolds, like turnips and swedes, are estimated at a higher yield than in any preceding year, being more than $3\frac{1}{2}$ tons per acre above the decennial average. The breadth of land devoted

Mangolds.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Tons.	Tons.	Tons.	Tons.	Tons.
England ..	9,072,616	7,542,694	21·29	19·54	17·56
Wales ...	198,242	176,398	18·32	17·98	16·21
Scotland ...	76,554	55,181	16·68	18·71	17·52
Great Britain	9,347,412	7,774,273	21·17	19·49	17·52

to this crop in Scotland is comparatively so small that its influence on the returns for the whole country is slight, but it may be noted that the Scottish yield is nearly 1 ton per acre short of the average.

The Hay crop, both from arable and pasture land, appears to have been very satisfactory as regards bulk. In the case of

clovers and rotation grasses the yield was about $5\frac{1}{4}$ cwts. over average, Scotland again occupying a considerably less favourable position than either England or Wales.

Hay from Clover, Sainfoin, &c.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
England ...	57,123,299	42,492,701	32·87	24·56	26·68
Wales ...	5,920,302	4,030,483	28·35	19·96	22·55
Scotland ...	13,878,813	13,521,389	33·21	31·87	31·73
Great Britain	76,922,414	60,044,573	32·53	25·48	27·26

From permanent grass the yield of hay per acre was relatively somewhat heavier than from clovers, the estimate being more than $5\frac{1}{2}$ cwts. above the average. But while the clover-hay crop has only twice previously been exceeded, viz., in 1889 and 1898,

Hay from Permanent Pasture.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1892—1901.
	1902.	1901.	1902.	1901.	
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
England ...	110,467,298	62,142,295	27 79	16·55	21·73
Wales ...	10,029,186	6,498,745	21·16	14·01	17·45
Scotland ...	3,967,753	3,680,362	30·17	27·97	28·74
Great Britain	124,464,237	72,321,402	27·17	16·63	21·52

the yield of meadow hay is less than in four recorded years, viz., in 1888, 1889, 1894, and 1898. Putting together the aggregate production of both kinds of hay, it will be seen that the total output exceeds 10,000,000 tons, and is therefore larger than any previous year, with the exception of 1889, 1894, and 1898.

THE HOUSE-SPARROW.

The house-sparrow (*Passer domesticus*, L.) is so well known that a detailed description of it is unnecessary. In almost all parts of Europe where grain is grown it is, unfortunately, far too common. In New Zealand, Australia, and North America it has been introduced and has increased there, as here, to such an extent as to become a serious pest to the farmer and gardener alike.

It may perhaps be advisable to note that the hedge-sparrow (*Accentor modularis*, L.) is in no way related to the house-sparrow, the former being a very useful bird, which needs protection, since its diet consists almost entirely of insects. It has a soft narrow beak quite unlike that of the house-sparrow, which is hard and specially adapted for eating seeds.

The nest of the house-sparrow is placed in all sorts of situations: exposed in trees and shrubs, in hayricks and thatch, holes in walls and trees, in rain-water pipes, under the eaves of houses, in ivy-clad walls, and in the nests of the house-martin. It is rarely found more than a mile or so from human dwellings, and is usually made of straw, hay, or dried grasses, more or less in the form of an oval ball with an opening into it at the side. Five or six eggs are laid, of a bluish-white ground colour, variously blotched or speckled with brownish or blackish markings.

Each pair of birds may rear two or three broods during the summer, which accounts for the rapidity of its increase when unmolested in districts where food is plentiful.

The only bird likely to be mistaken for the house-sparrow is its near relative the tree-sparrow (*Passer montanus*, L.). The latter is a much rarer and more locally distributed species, somewhat smaller in size, with two white bars across its wings instead of one as in the house-sparrow. The male house-sparrow has a white patch on its cheek or side of its head; in the tree-sparrow the white cheek has a black triangular patch on it.

To practical farmers who are not concerned with speculations on the possible deleterious effects of an interference with the "balance of nature," the case for the reduction of the sparrow to smaller numbers than exist at present rests upon an estimate of the damage done, compared with the useful work carried on by the bird.

It may be taken for granted that no one wishes to exterminate the sparrow altogether, but it is the opinion of all who have paid any attention to the subject, that the limits of the sparrow's usefulness have long ago been overstepped and its reduction to more reasonable numbers is as necessary in the interests of the community at large, as the reduction of a superabundance of rats, or any other destructive beast, bird, or insect.

Hundreds of examinations of the contents of the stomachs of sparrows have been made in this country and abroad, and it has been shown that from 75 to 80 per cent. of the food of adult birds throughout the whole year consists of cultivated grain of some sort. To a farmer in the neighbourhood of a town or village where the bird has been unmolested, this fact is forcibly brought home to him in much diminished crops. In such districts, the profitable cultivation of cereals soon becomes impossible and several years' observation and experience in the cultivation of experimental plots of varieties of grain has convinced me that no results of value can be obtained near villages where the sparrow has been allowed to multiply unchecked, especially if the areas cultivated are isolated from the larger arable fields.

In one parish with which I am acquainted over 28,000 sparrows were killed in three seasons by members of the Sparrow Club. It does not need special emphasis to convince anyone acquainted with the habits of the bird, that the maintenance of such a number as this must seriously interfere with the profitable cultivation of cereal crops.

The sparrow does most damage during the few weeks before harvest. Thousands of adult birds and young of the season feed upon the ripening grain and live almost entirely in the fields, deserting the village and farm homesteads for a time. Later they live mainly round human habitations, taking toll of grain from the stacks and poultry yards.

The destructive practices of sparrows are not confined to the consumption of grain crops. They are almost equally damaging to garden produce, apparently taking a delight in stripping gooseberry and red currant bushes of their buds, tearing in pieces various brightly coloured flowers, such as crocuses, primroses, and violets, eating the young shoots of carnations in winter, and pulling up rows of newly-sown peas in spring and summer.

Ricks and thatch are damaged by them, and rain-water pipes are frequently blocked by their nests.

It may reasonably be asked if nothing can be said in favour of the sparrow. Examination of young birds in the nest, and those recently fledged, has shown that they feed partially upon caterpillars, beetles, and other insects. The amount of their food consisting of insects is, however, not more than 50 or 60 per cent., and then only for a short period of their early life. The extent of their usefulness in this respect is, I think, not sufficient justification for maintaining the vast numbers which are met with throughout the country. Especially is this view strengthened when it is remembered that the sparrow drives away house-martins, many warblers, and other purely insect-feeding birds which would do most of the useful work carried on by the sparrow if undisturbed.

Any attempt to decrease this, or any other living pest capable of rapid reproduction, must be thorough and must embrace the whole of the district infested. The existence of neighbouring areas where the pest is allowed to multiply unchecked is a great drawback to success, and necessitates the constant repetition of remedial means, often for several years longer than would be the case if such unmolested areas did not exist. Not only should sparrows be destroyed round villages and hamlets, but attention to every isolated farmyard in the neighbourhood is essential. Sparrows left to multiply on one or two farms in a district soon spread over the neighbouring areas.

The particular devices for lessening the number of sparrows are very numerous. Eggs and nests may be destroyed in the breeding season, and young birds are readily caught during summer and early winter in wicker and wire traps. Various forms of nets may be employed on dark nights, around ricks, or ivy-clad houses where the birds roost. Shooting with small shot during winter is useful.

As individual private effort can have but a slight effect, the work of lessening the sparrow plague in a district should be carried out by the formation of a Sparrow Club.

The object to be attained should be made clearly known to all who join it. Anything like indiscriminate destruction of small birds in general should be strenuously avoided, the object being merely to reduce the numbers of the house-sparrow. Every encouragement should be given to the protection of all other small birds, unless there are obvious reasons for including other species than the sparrow in the black list.

Very frequently it is found that rats can be dealt with at the same time as sparrows.

The following may be taken as a scheme of rules, which can be amended or curtailed according to the peculiar requirements of the district :—

Rule 1. The name of the club shall be "The .... and District Sparrow [and Rat] Club, and includes the parishes of ...."

Rule 2. The club shall consist of subscribers or honorary members and working members. The annual subscriptions of an honorary member shall be not less than 5s. [or 2s. 6d.], that of a working member 1s. Honorary members shall be exempt from bringing heads.

Rule 3. House-sparrows and rats only to be decreased. Each sparrow shall count one point, each rat two points.

Rule 4. Each working member shall send in during the year birds or rats representing not less than 300 points before he is entitled to share in the division of the prize funds.

Rule 5. No birds or rats shall count unless they are taken the parishes mentioned in Rule 1. Any member infringing this rule shall be fined 5s.

Rule 6. Members found smoking in stackyards or on any

premises whilst catching sparrows or rats, or loading shot-guns with ordinary paper instead of stout wads, shall be disqualified for all prizes.

Rule 7. The balance at the end of the season shall be divided among the working members according to the total number of points obtained during the year.

Rule 8. Collectors shall be appointed in various parts of the district to receive and destroy heads of birds, and tails of rats, once a week, at a time fixed to meet the convenience of the working members.

Rule 9. An annual meeting shall be held at .... in May or June, at which the accounts shall be audited, the funds divided in accordance with Rule 7, officers appointed for the succeeding season, and the transaction of any other business connected with the club.

A club in Kent, worked along the lines indicated above, with less than twenty working members, destroyed during the last three seasons over 28,000 sparrows and more than 16,000 rats in a comparatively small area with obviously useful effect. The annual prize-money amounted to a little over £6 per annum.

If such clubs could be instituted and their work carried out systematically for three or four seasons throughout the country, there would be a manifest improvement in increased crops on farms and gardens and a better chance for the multiplication of martins and other insect-feeding species of birds.

JOHN PERCIVAL.

ON THE CULTIVATION OF LUCERNE.

Lucerne has not hitherto been appreciated or used in England to the extent that it has been on the Continent and in America. English farmers, however, are now realising its value as a fodder crop, and each year it is being more extensively grown in the southern and midland counties, especially in those districts where there are warm calcareous soils. It is not likely however, that in this country the crop will ever attain such an extensive cultivation or quite the degree of popularity which it has secured in other countries. Compared with that of southern Continental districts, in which lucerne is largely grown, our climate is moist and cool, and is much better suited to the growth of grass, vetches, and other fodder crops.

The crop is essentially one for dry climates and dry soils. For several years past the English seasons have been dry and have suited the crop admirably, a fact which, no doubt, accounts to a great extent for the increased amount of attention which lucerne is now receiving from farmers. Although a calcareous soil is not essential for its successful growth, the crop thrives better where there is plenty of lime in either the soil or the sub-soil. Where such a favourable condition exists, the long strong roots, which render a crop of lucerne practically independent of rain, often penetrate to a depth of many feet. The duration of the crop varies somewhat,but in this county under favourable conditions it will usually continue to yield a fair bulk of produce during a period of from five to eight years.

Satisfactory results can be secured only when the seed is sown on thoroughly clean land. Where lucerne is sown alone this is of vital importance, for if the land is at all foul, innumerable weeds come up with the young plant and choke it. It is generally advisable to get the land in clean condition in preparation for sowing, by the growth of a fallow crop, which should be heavily manured and carefully cleaned. Potatoes are excellent for the purpose. Farmyard manure should generally be avoided,

at least as a direct application before sowing, on account of the weed se ds it may contain, although its effects in other ways are very good. Three or four hundredweights of superphosphate and one hundredweight of sulphate of potash form a suitable dressing of artificial manures. On land where lime is deficient a dressing of lime will prove beneficial.

French seed is preferable to American, as plants grown from the former usually prove hardier during a severe winter. Experience has shown also that on land sown down for long periods, French seed will give better crops than American. The seed may be sown either alone or with a corn crop. In this country the former method is generally adopted. The best time for sowing, when the seed is sown without a corn crop, is between the middle of April and July. From 20 to 28 lb. of seed is sown per acre. The necessity for carefully cleaning the land by means of horse or hand-hoeing during the first year of growth, and subsequently in the spring of each year, makes it desirable to drill the seed, allowing 6 to 8 inches between the rows, rather than to sow it broadcast.

A series of experiments carried out by University College, Reading, in the years 1897—1900, proved, among other results, that drilling was to be preferred to broadcasting. It was found that 20 lb. of seed drilled gave as good results as 28 lb. of seed broadcasted. In these, and also in later, trials, good results were obtained, on the lighter class of soils, by including a few pounds of lucerne seed with the grass and clover seeds sown for a two or three years' ley.

Lucerne should be cut just before the plant begins to flower. It does not attain its full productiveness in its first year and will yield probably not more than two cuttings, but in subsequent years it may produce three or four cuttings in favourable seasons. The crop is not well adapted for grazing. It makes good hay if the leaves can be preserved, but they are liable to be lost in the drying and handling of the crop. The most satisfactory method of utilising the crop, however, is to give it to stock in a green state. It yields a large bulk of produce which for this purpose is invaluable.

JOHN O. PEET.

WOOL AND SHODDY.

The consumption of wool in the United Kingdom is continually growing, and amounts now to more than 13 lb. per head of the population per annum. It is estimated that the amount of raw wool retained for consumption in the United Kingdom and in the United States since 1880 has been as follows :—

Year.	In United Kingdom.	In United States.
1880	371,000,000 lb.	331,681,000 lb.
1890	427,000,000 lb.	385,671,000 lb.
1900	498,000,000 lb.	437,003,000 lb.
1901	541,000,000 lb.	465,536,000 lb.

The imports of woollen rags into the United Kingdom were :—

In 1880	92,279,000 lb.
,, 1890	77,636,000 lb.
,, 1900	68,757,000 lb.
,, 1901	66,936,000 lb.

In the year 1900 we exported 12,938,000 lb., and in 1901 10,761,000 lb., thus leaving a net import for each year of about 56,000,000 lb. It is not possible to arrive at the amount of shoddy produced at home with any degree of accuracy, but I estimate it at 64,000,000 lb., which, with the import, gives a total consumption of 120,000,000 lb.

The consumption of shoddy in the United States in 1900 was 71,500,000 lb., or 16·33 per cent. of the raw wool. Of this quantity 34,500,000 lb. was imported, and 37,000,000 lb. made at home.

A summary of these figures works out as follows, so far as the year 1900 was concerned, a year, it will be noted, when the British consumption of wool was below the average of recent years :—

Consumption of Wool :—	
In the United Kingdom	498,000,000 lb.
In the United States	437,000,000 lb.
Consumption of Shoddy :—	
In the United Kingdom	120,000,000 lb.
In the United States	71,500,000 lb.
Total Wool and Shoddy... ...	1,126,500,000 lb.

It will be seen that the proportion which shoddy bears to the total consumption of material is a trifle under 17 per cent. for the two countries together.

The position of the linen trade is shown by the following statistics of the production of goods (in millions of yards) annually :—

Period.	England.	Scotland.	Ireland.	Total.
1791—1800	13	22	42	77
1821—1830	24	60	90	174
1861—1870	54	140	204	398
1891—1893	42	130	172	344
1895	—	—	—	400

The *Yorkshire Daily Observer* gives the value of the output of cotton goods in 1900 as £79,922,000, of which amount £65,903,000 went for export.

By way of clearing up some misconceptions, it may be as well to put into concise form what is the true meaning of the various names of goods in everyday use in the wool industries.

"Woollen" is the name given to fabrics made from short, fine wool. The wool is carded and spun in such a manner as to cause the fibres to intersect each other and become involved, so that the yarn is as bulky as possible, and is fluffy or spongy. In woollen goods the weave or make is not visible. They are milled and finished with a smooth surface as in broadcloth, or left rough as in cheviots and tweeds, or they have the nap raised as in flannels or blankets.

Most of the wool for use in the woollen trade is imported.

"Worsted" is the name given to goods made from long wool. The preparation and spinning of the yarns is the reverse of that practised in woollen. The wool is combed for the purpose of separating the long fibres from the short. The long portion is called tops, and is used in the worsted manufacture. The short is called noils, and is sold to the woollen branch. The tops pass through a number of processes, which may be described as persuasive, to cause the fibres to lie flat and parallel.

In worsted goods the weave or make is distinctly visible. All the British long and half-bred wools are used in this branch of the trade or in worsted stuffs.

"Worsted stuff" is the name of the most important class of goods in the ladies' dress trade. The weft yarns are worsted,

spun in exactly the same manner as in the worsted trade proper, but the warp is cotton, which is used to secure greater lightness and strength. The presence of cotton in these goods is avowed and evident. The wools used are the same as in worsted, with the addition of alpaca, mohair, camel hair, and cashmere.

"Shoddy" and "mungo" are names of wool which has been used before.

Shoddy is produced by picking to pieces woollen or soft rags or soft spun yarns, such as stockings and other hosiery, including tailors' and hosiers' cuttings, and the yarn waste made in the mills.

Mungo is produced from hard rags, out of worsted or worsted stuff goods, and is consequently longer and coarser than shoddy.

The cotton or any other vegetable matter in these rags is destroyed by a process known as carbonising or extracting. The rags are dipped in dilute sulphuric acid and afterwards dried by hot air, when the cotton is beaten out as powder. Shoddy rags go through the same process when there is any suspicion of the presence of anything that is not wool. It will be seen from this that goods made from shoddy and mungo are always in good sanitary condition.

After being extracted, the wool is carded and spun just in the same manner as it was in the first instance.

The value of this second-hand wool is, for the best qualities, about twice that of the average value of the English clip, but, just as in the case of first-hand wool, there is a great variety of prices. Some of it is mixed with the raw material for making the very finest cloths, for various reasons, of which price is not always the principal. Some of it is used to form the back of worsted coatings to give weight and warmth. The cheaper sorts are "scribbled" together with cotton before spinning, or are spun alone and woven with a cotton warp. The goods thus produced are called Union Cloth.

Shoddy and mungo are not used with English wool, and, speaking generally, they are not used in either branch of the worsted trade. All the fabrics which are popularly known as ladies' dress goods are entirely free from shoddy. What are known as tailor-made costumes and dresses belong to the woollen branch, and therefore may contain shoddy.

It cannot be too clearly understood that this article is consumed entirely in the manufacture of woollens, and is consequently generally worn by men.

The names given to the various cloths produced in the woollen trade are too numerous to mention here, and, as a rule, convey no idea of what material they consist of, as the name is usually descriptive only of the method of construction. There are, however, some exceptions. For instance, flannel is the name of a particular "make" of goods which are composed entirely of wool, whereas flannelette is the name of the same "make" composed entirely of cotton.

Some of the names of woollen goods will, however, be quite familiar, such as, pilot, president, nap, witney, melton, vicuna, army cloth. Any of these may contain shoddy, especially the low-priced ones. As shoddy is wool, it is not possible to detect it, when once mixed in, by any chemical or microscopic test.

The Union Cloths are also given the same names as in the woollen trade when made the same way, together with such names as backed worsted and serge, duffel, twill, fancy costume cloth, &c. These contain cotton either scribbled or carded into the shoddy weft, or made of pure shoddy weft with a cotton warp. The presence of cotton is easily detected, and there is no excuse for ignorance in the matter on the part of any tailor or dealer in cloth. Dilute sulphuric acid will burn out the cotton and leave the wool. Caustic soda will destroy the wool and leave the cotton.

For a small fee the Bradford Conditioning House (a municipal institution established by Act of Parliament) will give a certificate not only as to whether a cloth is all wool or not but also what percentage of cotton or other vegetable matter it contains. Any person can form an idea for himself by picking the cloth to pieces and applying a lighted match to the threads. Cotton blazes up quickly and has but little smell, wool scorches and forms a cinder and gives off a pungent odour which is easily recognised.

Protection against the fraudulent sale of cotton, or mixtures of cotton and wool, as pure wool is afforded by the Merchandise Marks Acts.

JOHN W. TURNER.

THE BRINED ONION INDUSTRY.

Representations were recently made to the Board of Agriculture by the Biggleswade Trades and Agricultural Association to the effect that the cultivation and preparation for pickling of onions, gherkins, and cauliflowers, which was until a few years ago a flourishing industry in the Biggleswade district, had declined considerably since 1895, owing, it was said, to the increasing competition of Dutch and Belgian producers, who were apparently able to place their goods on British markets at lower prices than the market gardeners of North Bedfordshire could afford to accept. This decline was not only a matter of deep concern to the gardeners at Biggleswade, but it had been accompanied by a large reduction in the incomes of the working classes in the neighbourhood, as the various operations connected with the growth and brining of pickling onions gave employment to a large number of women and children. The Board accordingly sent an officer, who was accompanied by a representative of the Biggleswade Association, to investigate the conditions under which the brined onion industry is carried on in Holland and Belgium.

It appears that the chief centres of the production of onions in the Netherlands are the provinces of Zeeland and North and South Holland, and that an area of 7,500 acres, exclusive of market gardens, is estimated to be annually under the crop.

The small white onions, known as "silverskins," the competition of which was more immediately the subject of complaint, are grown mainly in the provinces of Gelderland and North Brabant, though in recent years they have also been cultivated

on a small scale in South Holland and Zeeland. The total acreage sown with this variety does not, however, exceed 125 acres. The growers are mostly small market gardeners or peasant farmers occupying about 2½ acres of land; a few of them rent larger areas, but their holdings seldom exceed 5 acres. They are nearly all tenants paying rents ranging from £3 7s. to £5 per acre according to the quality of the land, and their cottages are rented at 2s. to 3s. 6d. per week.

On the holdings of 2½ acres little outside labour is required, as the occupier is usually able to work the land with the aid of his wife and children: and large families are the rule rather than the exception amongst the small growers. It is the practice to put children to work on the land at 10 or 11 years of age, when they are taken away from school. Sometimes, however, and especially in cases where the area cultivated amounts to 5 acres, occasional labourers are employed to help in digging and clearing the land, and again at harvest, sufficient work being found for two men for about three months in the year. But, wherever it is possible, women and children are employed, as their labour is cheaper. Children are largely employed for pulling the onions.

Adult male labourers earn from 2s. 6d. to 3s. 4d. per day. Women are paid 2s., and children 1s. a day. No food or other perquisites are given by the employers.

After the onions have been pulled and dried they are sold raw and unpeeled to the agents of the brining factories. The price paid for them varies with the supply and with the quality. This year the average price paid for the greater part of the crop was exceptionally low, amounting to only 3s. 4d. per bag of 110 lb. Last year the growers received from 5s. to 5s. 10d. per 110 lb.; and in 1900, when silverskins were scarce, as much as 16s. 8d. per bag was paid in some cases. These prices are paid for the crop when pulled on the holding, all expenses for bags and transport to the factories being borne by the factories.

Owing to the frequent variations in the crop and the fluctuations in prices, the cultivation of silverskins is looked upon as a speculative business. On this season's crop, for example, with prices as low as 3s. 4d. per bag, the cultivators have incurred a loss. The Dutch growers, however, are a sober, hard-working

class with few wants beyond the bare necessaries of life. They remain, as a rule, very poor, and their food consists for the most part of bread, milk, and potatoes. They usually fatten a pig, and grow sufficient potatoes and other vegetables to meet their own requirements.

The peeling is chiefly done by women and children at their own homes in the towns where the factories are situated. The peelers fetch the raw onions from the canal wharf and deliver them peeled and washed to the factories. The usual price paid for peeling is one penny per kilo. of 2·2 lb. for silverskins, and three-fifths of a penny per 2·2 lb. for large white and brown onions, known as "bread and cheese onions."

One advantage of the factory system is the great facilities it affords for turning out large quantities of brined onions of uniform size and appearance selected from the produce of a large number of small growers. In the case of one of the largest factories, which exports a considerable quantity of silverskins to Great Britain, this process of selection is assisted by the practice of sorting the onions when purchasing them from the growers in order to exclude outside sizes.

Another important feature noticed in one of the Dutch brining factories is the use of improved apparatus for grading the onions. In place of the round hand sieves with cane bottoms and a square mesh, which are still used in Biggleswade, an oblong riddle is employed, about 4 feet long by 3 feet 6 inches wide. This consists of three trays fitting into each other, with zinc bottoms perforated with round holes, according to the sizes of the different grades of onions that each tray is intended to deal with, the tray with the largest holes being at the top, and that with the smallest at the bottom. A further improvement observed is the use of horizontal troughs for the sorting of the riddled onions, in order to pick out discoloured specimens, "pipes," and bad shapes.

The onions are sorted into four sizes, the finest being, on the whole, smaller than the best English; and are then put into casks and brined.

As regards prices, the first grade fetched this year 70s. per hogshead, f.o.b. Rotterdam, according to the latest quotations, and other grades ranged down to 24s., the latter being for very

large sizes. These prices are, however, low, and due to the exceptionally abundant crop of this year. Last year the first grade fetched 80s. per hogshead, and the other sizes were correspondingly dearer.

Freight rates are quoted from Rotterdam to London, from which it appears that about 2s. 6d. to 3s. per hogshead, or at least 10s. per ton, must be added to the Rotterdam prices for brined onions in order to get at the actual cost of the goods to the London pickling firms ; and something must also be allowed for the cartage from the wharf or station, as the case may be, to the picklers' premises.

Railway charges from Biggleswade to King's Cross vary from 9s. 2d. per ton for a single ton, to 6s. 3d. per ton for 4-ton lots.

The foregoing observations embody the principal points brought out by the inquiries made with regard to the Dutch trade in brined onions. The social and economic conditions under which the industry is conducted in the Netherlands differ in many respects from those existing in this country, and these differences must be taken into account in any attempt to institute a comparison between the expenses of cultivation on the Dutch small holdings and on the large market gardens in the Biggleswade district. For instance, it has been suggested that the cost of labour in Holland is so much cheaper than in this country, that it has enabled the Dutch exporters to undersell the British producer. But it has already been pointed out that the Dutch gardeners may themselves be regarded as labourers, inasmuch as they perform practically the whole of the work on their holdings, with the aid of their wives and children. They are a sober, hard-working class with little or no ambition, and their standard of living is of the humblest description. In seasons of low prices, such as is the case this year, the Dutch cultivator is worse off than a labourer, as his net profits would not represent a return for his work equivalent to the wages ordinarily paid to male labourers in the neighbourhood, which range from 15s. to 20s. a week. When prices are high his profits naturally rise, but after he has paid his rent and manure bill they seldom much exceed the weekly wages of a day labourer. So that, though wages in Holland are actually not much less than those paid in the market gardening districts in this country, they

do not enter so largely into the cost of production, because the Dutch grower of silverskins employs little outside labour, and is content to work on his holding for a return which in some seasons is not equivalent to the wages of ordinary labourers.

On the other hand, his outgoings for rent are higher per acre than those ruling in this country, and he can claim little advantage on his manure bill. It is clear, therefore, that, even under the most favourable conditions, the net profits realised by the cultivator of silverskins in Holland would be quite inadequate to satisfy the social requirements of agriculturists and market gardeners in this country.

In connection with this question of the relative cost of labour it must, however, be observed that in the Netherlands all the expenditure involved in dealing with the crop after it is gathered is borne by the brining factories. And in the case of the cost of peeling, which is the largest item in the labour bill, there would seem to be a difference of nearly one penny per peck between the prices paid to Dutch peelers and those quoted by the Biggleswade growers. The former receive one penny per kilo., which is under $7\frac{1}{4}$d. per peck of peeled onions, while at Biggleswade the price paid is stated to be 8d. a peck.

These differences, however, have not been of sufficient influence to enable the brining factories to place their goods on our markets at prices persistently lower than those at which English goods have been quoted ; and, in fact, the evidence collected by the Board both in the Netherlands and in this country has gone to show that the prices paid by pickling firms for first quality Dutch silverskins in brine delivered in London have, in some seasons, been higher even than the prices quoted for home produce. It is, indeed, a mistake to assume that the increasing demand for Dutch silverskins in this country is to be explained by reference merely to the question of prices. Nor is it to be explained by any real difference in the quality of the onions, since the silverskins grown in Holland do not possess any inherent properties which make them intrinsically superior to the onions of the same species produced in this country. The secret of the success of the Dutch competition is to be found mainly in the fact that the onions exported from the Netherlands present, on the whole, a better appearance, and more readily

meet the requirements of the pickling firms, because more effective methods and greater care are employed in their preparation for brining. The organisation of the brining industry in the Netherlands has enabled the factories, by collecting their supplies of raw onions from a large number of growers and by the use of improved apparatus, to send to this country large consignments of onions in brine possessing greater uniformity in size shape and colour than it seems possible to obtain by the methods at present adopted at Biggleswade. It is just this uniformity in the bulk which the great pickling firms in this country desire, and for goods possessing it they are prepared to pay a higher price than for produce which is deficient in this respect.

Summing up the results, it may be said, therefore, that the success of the Dutch trade in brined vegetables is due to the better organisation of the industry, and to the humbler standard of living of the Dutch growers, which enables them to be satisfied with a smaller profit, and by these means to overcome the disadvantages of heavier rents and freights.

AGRICULTURE IN HUNGARY.

The second Exhibition of the Hungarian Agricultural Association was held at Pozsony during September last, and embraced a very complete representation of the agricultural interests of Hungary.

The chief interest of the Exhibition lay in the indications which it gave of the remarkable developments in agriculture which have characterised the last twenty years in the history of that country. Hungary is, to a large extent, a land of small farmers, great numbers of whom are owners of their land. These small proprietors, the so-called "peasants," have all the appearance of prosperity. The productions of the country are very varied, and the vine is cultivated to a large extent, more especially in the hilly districts. Great areas are devoted to cereals and maize; and sugar beet, with other classes of roots, are largely grown, as is fruit of many kinds. Horses, cattle, sheep, pigs, and poultry are kept to a considerable extent, whilst dairying is one of the most important industries. In a country of widely-wooded tracts study is given, especially by the larger landowners, to forestry. All these branches were represented in the Exhibition, and many other minor trades which can hardly be termed agriculture, though of importance to the rural population.

Promoted by the national association referred to, the entries were entirely restricted to exhibitors residing in Hungary. Even those who live in other sections of the Dual Empire were unable to compete. It was essentially, therefore, a national show, and as such, gave a better idea of the resources of the country than would otherwise have been the case. As might be expected, the exhibits were drawn to a larger degree from the western than the eastern districts of Hungary, and, as is generally found in our English shows, the exhibits were most numerous from the locality in which the show was situated. But it was especially interesting to note that a considerable proportion of the

exhibits in the stock classes were sent by peasant farmers, though the larger or professional breeders were by no means unrepresented.

The horse section of the show was well represented by 237 animals, the quality of which, considering that at least half were sent by peasant farmers, was most satisfactory. It is not to be expected, however, that a farmer who has fifty or a hundred acres can maintain the same class of horse as a landowner or large farmer. But the small farmers know and like to keep a good animal, and in many parts of Hungary horse-breeding is an important part of the year's work. These Hungarian peasants breed large numbers of the horses used in several European armies. It is well to remember that in Hungary horses are used for draught and ordinary farm work to an extent not common in other Continental countries, where cattle are employed almost exclusively, which fact explains the greater number of horses kept. Among the horses exhibited were a number of good Arabs, a few thoroughbreds, and a considerable selection in which hunter and hackney blood was evident. About twenty years ago Arabs were chiefly employed for crossing with the Hungarian native Mura, the latter a hardy but slow-moving animal. Since that time English thoroughbreds, hunters and hackneys, have been preferred, giving a more useful and, therefore, more saleable animal. Heavy Belgian stallions have also been used to a more limited extent. The Mura is very low in the back, and, consequently, the cross is not always according to our English ideas of conformity.

The cattle section was very large, consisting of upwards of 800 exhibits, and here was to be found a much greater limitation of type than might have been expected. The Alföldi cattle are chiefly kept on the low lands bordering the Danube and the plains, and are used for draught purposes. They are heavy in bone, and would scarcely be worth keeping if that were not so, as the meat is hard, and the milk given by cows very scanty, though rich in butter-fat. They have neat heads, surmounted by very long, widely-branching horns, and are large in body. These powerful animals are bred in a natural manner, are never housed, and the calves are allowed to suck their dams. Another breed is the Erdelyi, which is usually found on the higher lands and in

Transylvania. This is a slighter animal, much lighter in bone than the Alföldi, and with small horns. It has been chiefly bred for early maturity, and for meat and milk qualities. In both these breeds careful selection has taken place and pedigrees adopted. But the greater number of cattle exhibited were of milk-producing breeds, such as the Bavarian Algau, the Tyrolese, and the Swiss. Many of those exhibited by peasant farmers were really excellent specimens, and give an impression that the Hungarians have made a wise selection for this special purpose. But it is a surprising fact that our English breeds, either pure or crossed, were unrepresented in the Pozsony Exhibition, and it would appear that their value as either meat or milk producers is unknown, or not appreciated, in Hungary.

In the sheep section the breeds represented were the Finomgyapjas, large-bodied, huge-horned animals, whose flesh cannot be anything but coarse, but it is bred chiefly for the wool, which is very abundant and fine in texture ; the Rambouillet ; the Negretti-Rambouillet, a cross between the last named and a native black-woolled breed ; and a few Hampshire Downs. The three first named are strong in wool qualities, and the last has been introduced for its meat properties. Mutton is evidently not much in demand in Hungary.

In pigs the ubiquitous Yorkshire was strongly in evidence, and it is scarcely surprising where pork is eaten to so large an extent that this should be the case. Some very fine specimens of Yorkshires were exhibited. The Hungarian Mangalicza is both white and brown in colour, is long in head and snout, with rough hair, though a few were exhibited with finer hair ; and a third breed, called Fekete Fecslchasu Mangalicza, has a blue-black body with a white stomach. A few Berkshires were shown, but they were evidently not pure, as they were streaked with white ; some Poland-Chinas, Westphalian, &c., and from this fact it is evident that an attempt is being made to improve the pigs of the country by the introduction of fresh blood. A most peculiar pig was exhibited, called Baznai, said to be from Transylvania, small in size, black in body, with a broad white circular band immediately behind the forelegs.

The poultry exhibited formed a very good collection, and a proof of the great interest now manifested in this branch of rural

industry. The exhibits numbered nearly 350 lots. Instead of the almost bewildering variety of breeds met with in an ordinary British poultry show, many of them useless for practical purposes, there were comparatively few, as official influence has been used to secure the spread only of such classes of fowls as appear most suited to the country. Among fowls the Orpington is preferred, chiefly Buffs, but a white variety of Orpington is now regarded with especial favour, as its feathers are of greater value. Black Orpingtons are not liked nearly so well, nor Black Langshans, but a White Langshan was displayed, its feathered legs, however, not generally meeting with favour. The native Hungarian breeds partake largely of the type found in Southern Europe, namely, the Italian, or Leghorn as we call it, but smaller in size of body. This fowl, which goes under various names and is not very uniform, is said to be an exceedingly good layer, but poor in flesh properties. Of it, there are several colours, whites and browns predominating. They have a very peculiar small comb, in many cases merely rudimentary. The White Magyar fowl appears about the best of all these native breeds, either pure or crossed. Some Plymouth Rocks were exhibited, and there are many kept in Hungary, but they are not generally approved by reason of their yellow flesh and legs. The feature of the poultry section was undoubtedly the Embden geese, one of the finest collections ever seen together at one time. Geese are largely kept in Hungary, and the Embden has done much to improve the size and flesh qualities of the native races, which are, both white and grey, of a similar type, but small. The lots of both pure and crossed Embdens were very fine indeed. There were also good collections of Pekin ducks, as this breed is found more suitable in Hungary than the Aylesbury, and a number of very beautiful white turkeys.

The implement section was very small as compared with what is seen in our English shows. Several of our makers who have establishments in Hungary were represented, but there was nothing of special importance.

Various displays made by the local or village societies, which have done such good work in Hungary, were of special interest as showing what can be accomplished by combined effort. An

arrangement is here worthy of note, namely, that these societies are allowed to compete with the produce or stock of their members, the result of which is that a selection is first made in a village, and, whatever benefit accrues, either in the way of prizes or reputation, is shared by all—a species of co-operation which cannot fail to be of benefit. One of the most recent features in connection with the development of Hungary has been the remarkable growth of combined effort, chiefly in the direction of production, and the result has greatly increased prosperity in the rural districts. The displays made by the various Agricultural Colleges and Schools were very fine, and I do not remember to have seen their equal even in France, where so much is done in this direction. The entire Exhibition was essentially practical in its nature, although there was much in the way of fêtes, &c., to which we are unaccustomed. It cannot fail to have a great educational influence, and must prove an encouragement to those who have put forth such strenuous efforts for the development of Hungarian agriculture in all its branches.

EDWARD BROWN.

AGRICULTURAL AND MISCELLANEOUS NOTES.

Root-Knot Disease in Cucumbers and Tomatoes.

Cucumbers and tomatoes are often affected by a disease induced by the Root-knot Eelworm (*Heterodera radicicola*).

The first symptom of attack is a drooping and yellowing of the foliage, followed by the stem becoming limp and a collapse of the entire plant.

The finer branches of the root are more or less studded with swollen portions or "knots," varying in size up to one quarter of an inch across; knots of larger size are also often present on the thicker branches of the root (*see illustration*).

Microscopic examination shows the presence of numerous eelworms in the knots.

The eelworms escape from the knots into the soil, where they remain for a time and then enter the roots of other plants.

There is no method known by which eelworms in the roots of plants, or in the soil in which plants are growing, can be destroyed without injuring the plants.

To destroy eelworms present in soil, it must be thoroughly saturated three times, at intervals of a fortnight, with the following solution :—Carbolic acid one part to twenty parts of water.

A second remedy is mixing the soil intimately with gas-lime.

In either instance the soil so treated must remain for at least six weeks before it can be used.

When soil in a house is infected, it is safest to remove the whole and treat it outside ; the interior of the house should then be thoroughly washed with carbolic acid one part, water eight parts.*

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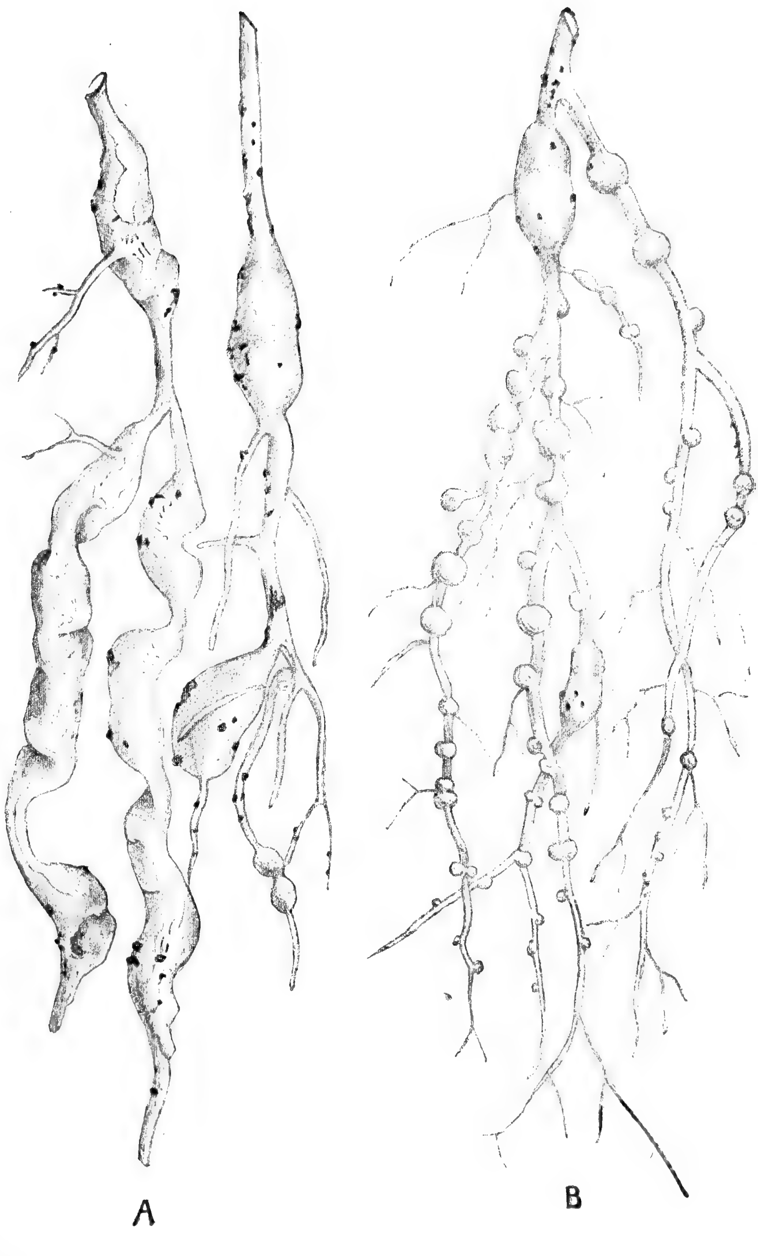
* Copies of this article may be obtained in leaflet form free of charge and post free on application to the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.



Roots of (A) Cucumber, (B) Tomato, attacked by Root-knot Eelworm.

A FUNGUS DISEASE OF YOUNG FRUIT TREES.

Eutypella prunastri (Sacc.).

Every now and again this minute but very destructive parasite appears under the form of a disease wave, causing a very considerable amount of damage, hundreds, or in some instances thousands, of young trees being injured or completely killed during one of these sporadic attacks.

Young standard fruit trees, up to the age of eight years, are most liable to the disease, and as the stem or stock is the part attacked, the girdling of this portion of the plant by the fungus growing in the bark and cambium means the death of the entire tree, which in a dull and damp season favourable to the rapid growth of the parasite, usually occurs during the spring following the first year of attack.

In the case of nursery stock, plum (especially the variety called Victoria) and apple trees have suffered most severely in this country ; peach, apricot and cherry to a less extent. The fungus is also often very abundant on wild plum, bullace, blackthorn, &c., and it is the spores produced on such wild trees that infect cultivated stock.

The first indication of the presence of the disease is the premature yellowing and fall of the leaves, followed by a drying up, browning, and shrivelling of the bark of the stem. During the spring following the first year's inoculation, numerous minute, elongated cracks, arranged in dense clusters, appear in the dried-up bark. These represent the first form of fruit produced by the fungus (Fig. 1), and are followed during the second season after infection by larger, fewer, and more irregularly scattered cracks, always transversely arranged in the now dead bark, containing a second and more highly developed kind of fungus fruit (Fig. 3).

The spores of the fungus are mature during late spring and early summer, and it is at this season that infection of young fruit trees takes place, the spores gaining access to the stem either through the unprotected ends of pruned twigs or through the living bark itself.

All wounds on the stem exposed by cutting off shoots, *how-*

ever small, should be protected *at once* by a coating of gas-tar, until the tree is at least ten years old. If this precaution is neglected, spores frequently alight on the newly-formed wounds, where they quickly germinate and spread upward and downward in the living bark, which becomes discoloured ; finally the fungus bursts through the bark it has killed, and produces spores on the surface (Fig. 6).

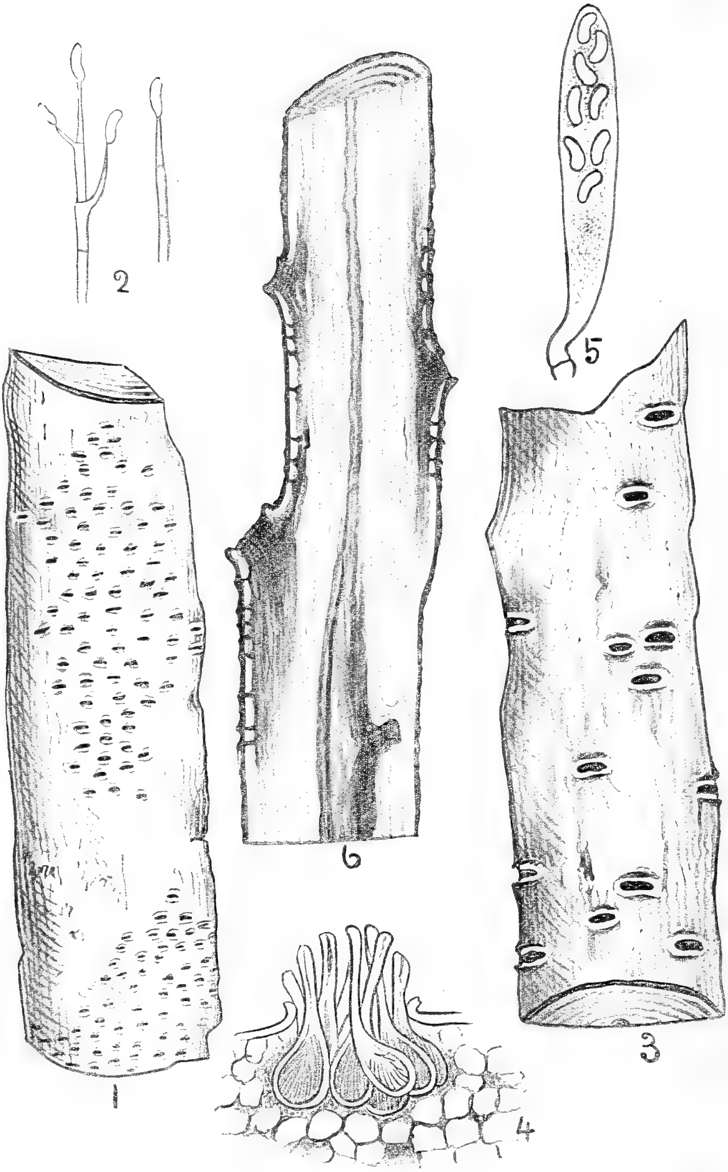
In order to prevent spores from germinating on the surface of the stem, and then entering through the bark directly, the entire stem of the tree should be painted with the following composition :—Reduce soft-soap to the consistency of thick paint by the addition of a strong solution of washing soda in water. Add one pound of powdered quick-lime to every five gallons of the dissolved soap, and stir the whole until thoroughly mixed. Apply to the trunk with a paint brush, being careful to cover every part. This mixture is tenacious, not easily dissolved by rain, and usually lasts for one season if properly made and applied.

Up to the present the disease has only been observed on a large scale where the trees are growing in stiff clay. Under such conditions it is very important to avoid deep planting, otherwise the roots are liable to be killed, owing to the presence of stagnant water, lack of air, &c., during a continuous rainy period, especially in spring or early summer. If the trees are not actually killed by this means alone, which is very frequently the case, their vitality is considerably weakened, and they are thus rendered more susceptible to the attacks of parasitic fungi.

In a case of an extensive attack which the Board have recently investigated in Notts, the trees had evidently been seriously crippled by being planted too deep in a strong soil, and were consequently specially susceptible to attack.

It is important that the fungus should be recognised by gardeners, as its frequent occurrence on wild trees in hedgerows might lead to the infection of nursery stock in a wholesale manner, as has in fact taken place more than once, unless detected and removed without delay.

All diseased plants should be burned at once, as, if allowed to lie about, the spores mature on the dead wood, and are scattered by wind, a risk of further infection being thereby incurred.



Fungus Disease of Young Fruit Trees.

(Eutypella prunastri).

Description of Figures.

1. *Eutypella prunastri*; conidial form of reproduction on an apple tree stem. Nat. size.

2. Conidia. × 600.

3. Second, or ascigerous, condition of fruit on plum stem. Nat. size.

4. Section through a group of ascigerous fruits imbedded in the bark. × 50.

5. Ascus containing 8 spores. × 400.

6. Median section through portion of the stem of a young apple tree, showing where the fungus had entered through the unprotected ends of pruned shoots. The mycelium of the fungus had discoloured the bark and wood, and finally burst through the bark to the surface. Nat. size.

BUNT AND SMUT

Both of these are fungoid diseases of cereals, and annually cause much damage. Bunt chiefly attacks wheat, and is characterised by the grains being filled by a black mass of fungus spores, which give a fœtid odour, especially when rubbed. Ears that are attacked are lighter than sound ears, and, therefore, stand more erect. They also remain longer green as harvest approaches. So long as the ears are undisturbed the black spore-masses remain unseen; it is only when they are rubbed or bruised in the process of thrashing that they allow the spores to escape.

Smut attacks all cereals, and is characterised by the grains being filled and destroyed by black dusty spores, which, unlike bunt, are quite conspicuous on the undisturbed plant. It is most common on barley and oats, where it may attack a large proportion of the ears. There are several varieties of this

fungus, but the distinctions are of no importance to the farmer.

Both in the case of bunt and smut infection takes place when the plant is quite young, the fungus pushing up inside the plant as it grows, until ultimately the immature seeds are attacked in the characteristic fashion. Prevention always takes the form of treating the seed in such a way that the spores are destroyed before sowing. In the case of wheat the most approved "steep" or "pickle" consists either in pouring the grain into a barrel or other receptacle containing a half per cent. solution of bluestone (copper sulphate) and leaving it there, with frequent stirring, for 12—16 hours, or in spreading the grain on a floor and sprinkling it with a 10 per cent. solution of the same material. The latter is the method most commonly practised in this country, the mode of procedure being to empty a sack (four bushels) on a wooden floor and to water it with 1 gallon of water in which 1 lb. of bluestone has been previously dissolved. The seed should be turned during the progress of the operation, and thereafter it should be turned two or three times, after which it is spread out in a thin layer till it is dry enough to sow.

The same method may be practised in the case of barley and oats, but as it is found that these grains suffer somewhat seriously in germination in consequence of the treatment, resort is had to the hot water system of Jensen. This is practised by placing, say, 10 gallons of boiling water in a large barrel or tub, and immediately adding an equal quantity of cold water. The whole should then show a temperature of 130—135° F., and care must be taken to secure, but not to exceed, this temperature. Needless to say, a thermometer must be used to determine the point. One bushel of seed contained in a sack or closed basket is then dipped into the water, where it remains for five to seven minutes, when it is removed and spread out to dry. The water in the receptacle is then brought up to the necessary temperature, and a new lot of grain immersed. It is found to be an improvement to soak the grain in cold water four or five hours before placing it in the hot water.

Both when treated with bluestone solution and with hot water a certain percentage of the grains are destroyed, but as

these have frequently been previously damaged in the process of thrashing or otherwise, and are therefore likely to produce weak plants, their total destruction is of less consequence. Seed that has been much rubbed in the thrasher suffers most in steeping. The loss by treatment with bluestone can be somewhat mitigated by dusting powdered lime on the grain after it has lain for a sufficient time in contact with the solution.

Some experiments in pickling wheat with other materials have been carried out at the Woburn Pot Culture Station of the Royal Agricultural Society of England,* and at the Agricultural and Horticultural School, Holmes Chapel. At the former of these stations, "smutty" wheat dressed with sulphate of copper mixed with other substances was tried. All the applications had a protective influence as compared with the grains that received no treatment. The most complete result was obtained with the hot water treatment and with a "local" mixture consisting of a mixture of sulphate of copper (24·77 per cent.) and carbolic compounds. In the latter solution the seeds were steeped for ten minutes, one part of the mixture being dissolved in 15 parts of water. Steeping the seeds for the same length of time in a solution of 1 part of sulphate of copper ("commercial pure") to 220 parts of water did not give quite such good results; while a Danish preparation—half sulphate of copper and half sulphide of potassium—of similar strength was less satisfactory. It is to be noted that there was more sulphate of copper in the "local" dressing than in the others. But no treatment was more successful than steeping the seed in hot water (at 127—133° F.).

More recent experiments with bunt (*Tilletia tritici*) have been carried out at the Holmes Chapel Agricultural School.† Samples of wheat badly affected with bunt were (*a*) steeped for fifteen minutes in copper sulphate, 1 lb. to 1 gallon of water; (*b*) steeped for four hours in a mixture of 1 lb. of copper sulphate and 1 lb. of quicklime to 1 gallon of water; (*c*) steeped in urine for one hour and dried with quicklime; (*d*) steeped

* R.A.S.E. Journal, 1900, p. 601.

† Cheshire County Council: Report on Grain Experiments in 1902.

for two minutes in water at 115° and fifteen minutes at 132° F.; (*e*) steeped for one hour in ½ oz. of a 40 per cent. solution of formalin to 1 gallon of water; (*f*) steeped for one hour in 1 lb. of crude carbolic acid to 1 gallon of water; and (*g*) steeped for six hours in ½ oz. pure caustic soda to 1 gallon of water. The first of these solutions, viz., the sulphate of copper, was found to be most satisfactory. The mixture of copper sulphate and quicklime, the hot water treatment, and the urine got rid of the bunt; but the quality of the grain was only fair, and in the case of the urine shrivelled. Neither caustic soda nor carbolic acid produced favourable results.

The Wisconsin Agricultural Experiment Station has published a report* of an investigation regarding the prevention of smut in oats by means of the submersion of the seed in a solution of formaldehyde. The disease is reported to have rapidly increased in that State, though the farmers there do not generally seem to be aware of its presence, as the smutted heads grow on weakly stalks, and generally head lower than the fully developed plants, so that they escape notice. The treatment recommended consists in steeping the seed in a solution of formaldehyde, and experiments were carried out to determine the most suitable strength of the solution. Seeds were accordingly soaked in 1 lb. of a 40 per cent. solution of formaldehyde to 50, 100, and 200 gallons of water, for periods varying from ten to sixty minutes. It was found that in order to be entirely effective oats should be submerged for twenty minutes in a solution made at the rate of 1 lb. of formaldehyde to 50 gallons of water. This gives the solution sufficient time to soften the outside covering of the oats, and to penetrate and kill the smut germs within the hull. A weak solution or a short period of submersion had only a partial effect, and when the treatment is not entirely effective a few smutted heads will inoculate the perfect ones, so that in two or three years the oats may be as bad as ever. Once the oats have been treated effectively and a little care is taken to prevent further contamination, it is said that several years may elapse before further treatment is necessary.

* 18th Annual Report, 1900—1901, p. 255.

The steeping of the oats should be done a few days before sowing, in order that they may be sufficiently dry to run easily through the drill.

It is further stated that this treatment of seed oats seems to facilitate the sprouting, and a difference of from two to four days in favour of the oats treated was observed, while no detrimental effect on the germination was apparent.

PURCHASE OF ARMY REMOUNTS.

The following information has been issued by the War Office :—

The class of horses required for the Army may be generally described as follows :—

Ages :—Peace, 4 off to 6 years. War, 6—10 years.

	Cavalry.	R.A.	M.I.	Transport.
Heights :—	14·3 to 15·3.	15·2 to 3.	14·2 to 15.	15·3.

Chargers should not be under 15 hands.

Colours :—Whites and greys are only required for special purposes. Other very light coloured horses are not accepted.

Bays and browns are preferred, but chestnuts and blacks will be accepted.

Entire or unmanageable horses are not admissible.

Horses with short docks will not be accepted.

Soundness in eyes, wind and limb essential ; no stale, upright, or overshooting joints, and no curby hocks admitted.

The class required is a deep, short-legged, short-backed, good-barrelled horse of the hunter stamp, with substance and quality, true action, and going quite clear of the joints.

The same description generally applies to cobs.

Artillery, Engineers and A.S. Corps should be good quality draught horses.

Numbers required annually in normal times of peace—2,500, as under :—

Cavalry	1,000
R.A., R.E., and A.S.C.	1,360
M.I.	140

In normal times of peace there are no specified dates for the assembly and inspection of horses.

Farmers having horses for sale should apply to the Inspector-General of Remounts, War Office, London, S.W., forwarding a description of their horses.

Forms to fill in the description of horses for sale and any other details will be furnished on application to the Inspector-General of Remounts.

THE CULTIVATION OF MEDICINAL PLANTS.

The Board of Agriculture lately received an inquiry from a correspondent regarding the prospects of growing various medicinal plants in this country as a profitable industry; and they have received the following information from the Secretary of the Pharmaceutical Society of Great Britain, whom they consulted on the subject:—

There appears to be a consensus of opinion amongst experts that the prospect of success in growing medicinal plants and herbs in this country for the drug market is very slender. So many considerations are involved, and apparently small points often turn out to be actual essential factors. There are the nature of the soil, the situation and aspect of the farm, the skill and technical knowledge of the cultivator, nearness of markets, price of labour, means of drying or preparing the collected crop, and many other vital questions to be taken into account before it can reasonably be decided whether a particular venture has any hope of success. It must be borne in mind also that the market for medicinal herbs and plants is a small one, and the demand appears to be amply met by present growers, who, even with the highest experience, often fail to avoid financial loss in unfavourable seasons. The experience of cultivators who have made considerable experiments in growing will readily confirm this.

Very little literature is published on the subject, as there is a natural reluctance on the part of those expert growers who

enjoy only a precarious success to give competitors the benefit of an expensive knowledge practically acquired. Mr. E. M. Holmes, the Curator of the Pharmaceutical Society, has, however, contributed to the Journal of that Society several short papers dealing with the cultivation of medicinal plants in the following localities :—Banbury, Lincolnshire, Hitchin, Brighton, Bedfordshire, Suffolk, and Surrey.

With regard to *Digitalis*, there is only one species used in medicine, namely, *Digitalis purpurea* (Linn). The *British Pharmacopœia* authorises the use only of the dried leaves collected from plants commencing to flower. The plant is abundant in a wild state in the South of England and in Central Europe. It does not flower till its second year—a matter for serious consideration by the would-be cultivator—and the drying of the leaves must be done immediately after collection. One hundred pounds of the fresh leaves yield about eleven or twelve of dried, and as the finished article only fetches about 34s. per cwt., the commercial attractiveness of this particular cultivation does not appear to be great. British growers cannot compete with German in regard to this article, the collecting in Germany being so inexpensive and labour of a sufficiently skilled character for the subsequent processes of drying being plentiful and cheap. About nine-tenths of the leaves used in medicine are stated to be of German origin, and although there is some reason to suppose that the English leaves are of a better quality and fetch a higher price, there is practically little to justify any marked preference. It is simply a question of price; and the cost of labour here appears to determine the matter in favour of Germany.

Practical growers have found the results in regard to the cultivation of Henbane to be very disappointing. As in the case of *Digitalis*, two years are required to raise one crop, and the market price seldom allows of a remunerative yield per acre when cost of cultivating, tending, collecting, and preparing has been deducted. Attempts have been made to develop a business in 'first year' or 'annual henbane,' but the leaves are almost valueless, and are not recognised officially.

The cultivation of Belladonna (*Atropa belladonna*) is also carried on in Germany, and the foregoing remarks largely apply

here. The yield under favourable circumstances is never above four tons per acre, and the market price is about £4 10s. per ton.

The cultivation of Lavender for the distillation of oil is reported to yield no profit at present prices.

Peppermint is a more remunerative crop, but it is stated that only an experienced person can hope to make it pay.

Aconite, poppy (for capsules), rhubarb, roses, chamomile, and liquorice are also grown, but definite information cannot be given about them. There might be an increasing demand for home-grown Aconite, as it is now made official in the *British Pharmacopœia*.

LOCAL AUTHORITIES' REGULATIONS ON THE SUBJECT OF THE MOVEMENT OF ANIMALS.

The following circular was issued by the Board of Agriculture on November 22nd, 1902, to Local Authorities in Great Britain under the Diseases of Animals Acts, 1894 and 1896 :—

"4, Whitehall Place, London, S.W.,
"November 22nd, 1902.

"*Transmission to Railway Companies, to the Railway Clearing House, and to the Board, of copies of Regulations made by a Local Authority.*

"SIR,—I am directed by the Board of Agriculture to acquaint you, in continuation of their circular letter of the 1st March, 1893, a copy of which is enclosed herewith for convenience of reference, that representations continue to be made to them of the inconvenience caused to Railway Companies and the Railway Clearing House by the non-receipt, in cases arising from time to time, of copies of Regulations made by Local Authorities on the subject of the movement of animals.

"The Order of 1893 which was mentioned in that circular has been revoked, but the following Orders of the Board now prescribe that a Local Authority shall send a copy of every such Regulation made under the respective Orders to every Railway Company having a railway station within the District of the Local Authority or within the part of their District to which the Regulation applies, and shall also forthwith send a copy of the Regulation to the Secretary, Railway Clearing House, Seymour Street, Euston Square, London, N.W., viz. :—

"The Pleuro-Pneumonia Order of 1895 (Article 12);
"The Foot-and-Mouth Disease Order of 1895 (Article 14);
"The Sheep Scab Order of 1898 (Article 9); and
"The Swine-Fever Order of 1894 (Article 13).

"I am accordingly to request that if any Regulations of your Local Authority under one or more of these four Orders are at present in force of which copies have not been sent to the Railway Companies concerned, and to the Clearing House, this omission should at once be rectified, and that you will give such instructions as will ensure that copies of any future Regulations will be sent so soon as they are made.

"The Board attach much importance to the proper fulfilment whenever occasion arises, of the requirements of the Articles above-mentioned, and also to that of Article 28 (3) of the Animals (Transit and General) Order of 1895, which requires that a Local Authority shall forthwith send to the Board a copy of every Order or Regulation made by that Local Authority under any Order of the Board. The Board have experienced inconvenience in certain instances where a Local Authority has not promptly sent such copy or has failed altogether to comply with that Article, and I am to take the present opportunity of stating that the Board would be much obliged if two copies, instead of one copy, were sent to them under that Article, of any existing Regulation which has not already been communicated to the Board, and also of any future Regulation that may be made.

"I am, Sir,
"Your obedient servant,
"(Signed.) T. H. ELLIOTT, Secretary."

[*Enclosure.*]
"Board of Agriculture,
"4, Whitehall Place, London, S.W.,
"March 1st, 1893.

"SIR,—I am directed by the Board of Agriculture to inform you that they have received numerous complaints from Railway Companies as to the difficulties experienced by their officials owing to the want of information in regard to Regulations made by Local Authorities affecting the movement of animals.

"The Railway Companies state that it not unfrequently occurs that animals, after having been conveyed to a certain district, have to be returned to the place from whence they were brought, owing to the fact that Regulations have been made by the Local Authority of the district prohibiting the introduction of the animals, the Railway Company having had no opportunity of making themselves acquainted with the fact that such restrictive Regulations existed.

"With the view of avoiding such inconvenience for the future, the Board have issued the accompanying Order * requiring that a copy of any future movement Regulations that may be made by Local Authorities under the Orders named in the Schedule to the Order shall be sent to every Railway Company having a Railway Station in a District or part of a District to which the Regulations apply, and also providing that a copy should be sent to the Secretary of the Railway Clearing House in London, who has arranged to communicate the Regulations to all Railway Companies in Great Britain.

"With reference to any existing Local Regulations which are now in force, I am directed by the Board to suggest that it would be a great convenience to the Railway Companies, and would help to ensure the efficient carrying out of the

* Entitled "The Regulations of Local Authorities Order of 1893" (not reprinted).

Regulations, if Local Authorities would be good enough to forward a copy of their existing Regulations to the Secretary of the Railway Clearing House, 123, Seymour Street, Euston Square, London, N.W., with the view to their notification to the several Railway Companies.

"I am to add that it is not intended that the Order or this letter should apply to Regulations which merely prohibit or regulate movement out of a shed, field, or farm, but only to Regulations which apply to the whole of the district of a Local Authority, or to any part thereof, in which there is a railway station.

"I am, Sir,

"Your obedient servant,

"(Signed.) T. H. ELLIOTT, Secretary."

ANALYSES UNDER THE SALE OF FOOD AND DRUGS ACTS.

According to the Annual Report of the Local Government Board for 1901–2 [Cd. 1,231], the total number of analyses under the Sale of Food and Drugs Acts in England and Wales in 1901 was 67,841, as compared with 62,858 in the previous year. This advance was chiefly due to a further increase in the number of samples of milk examined, which reached a total of 26,143 in 1901, or 2,920 in excess of the figures for 1900. Of the number of samples of milk analysed, 2,938, or 11·2 per cent., were found to be adulterated, as compared with 10·8 per cent. in 1900, which itself was above the average for the preceding six years. Legal proceedings were instituted in respect of 1,839 of the samples reported against and 1,527 convictions were obtained. The penalties amounted in the aggregate to £3,208 11s. 11d., and included 221 fines of £5 and upwards, 9 being of £20 each.

The number of samples of butter tested, which had shown a reduction of 104 in 1900, amounted to 11,938 in 1901, or 1,564 more than the total recorded for 1900. Adverse reports were made in 1,224 cases, or 10·3 per cent., of the samples examined, as compared with 7·8 per cent. in the previous year, and prosecutions were undertaken in respect of 734 samples. In 150 cases, however, the proceedings were either dismissed or withdrawn, or costs only were inflicted, the greater proportion of the 150 being in respect of samples of

watered butter. Penalties were imposed in 584 cases, amounting in all to £2,451. In addition, 104 fines, of the aggregate amount of £161 18s., were inflicted in respect of offences under the Acts relating to margarine.

The number of samples of cheese taken was 1,652, or 42 less than in 1900. Only 18 samples were, however, reported against, or 1·1 per cent. of the total number examined, as compared with 3·1 in the previous year.

Among other articles examined were 530 samples of bread, 587 of flour, and 1,374 of lard, the numbers reported against being 4, 2, and 5 respectively.

PHASEOLUS BEANS.

The Scientific and Technical Department of the Imperial Institute, London, have recently conducted an investigation into the nature of the poisonous constituent of the beans of *Phaseolus lunatus* of Mauritius. These beans have proved fatal to animals as well as to human beings, and the result of the inquiry is to show that they contain a considerable quantity of a glucoside capable of furnishing prussic acid. The beans somewhat resemble the ordinary haricot or kidney bean in shape, though they are usually rather smaller; they are light to dark brown in colour, with red or purple markings.

Several specimens of beans, said to be imported from India under the names of "Paigya Beans," "Burma Beans," and "Red Rangoon Beans," have lately been received from manufacturers and dealers in feeding-stuffs in this country, and have also been examined. These are all, undoubtedly, species of the *Phaseolus*; and, although they are not all quite so poisonous as the Mauritius variety, it would seem very undesirable to employ them as a feeding-stuff, at any rate in an uncooked state.

FATTENING FOWLS IN IRELAND.

Under the auspices of the Irish Agricultural Organisation Society, several societies are now taking up the question of

fattening fowls, and the following results of the first experiment were recently published in the *Irish Homestead.*

The experiment was conducted by the Windgap Co-operative Poultry Society, Co. Kilkenny. Four special fattening coops were erected, each coop having a capacity for seven fowls. Twenty-eight large, healthy, lean fowls were then purchased, and, having been weighed, were put into these coops in four lots of seven each. The following table shows that at the end of seven days' fattening the 28 fowls had increased in weight by 18 lb. 13 oz., and at the end of the tenth day they had increased by 26 lb. 5 oz., or nearly one pound each. Not only was there an increase in weight, but there was also a great improvement in quality:—

	When put in.		7th day.		10th day.	
	lb.	*oz.*	*lb.*	*oz.*	*lb.*	*oz.*
Coop No. 1—7 cockerels ...	30	6	35	8	37	8
,, ,, 2—7 pullets	24	13	27	8	30	12
,, ,, 3—7 cockerels ...	27	0	32	0	33	0
,, ,, 4—7 pullets	27	8	33	8	34	12

The fowls were not "crammed," but merely fed from a trough placed along the barred front of the coops, with semi-liquid food, consisting of four parts Indian meal and three parts pollard wet with separated milk. At the end of ten days the fowls were put into the fasting pen to prepare for killing, as no arrangements had been made to continue their fattening by a cramming machine, and it is only for ten days or so that they will continue to fatten by feeding from troughs. The cost of the food used during the whole time amounted to 6s. 8d., *i.e.*, at the rate of 10d. per stone, which is rather high, but the amount of flesh gained was worth 6½d. per lb. net, or a total of 14s. 2d. profit.

The foods used were the only ones available at the time of the experiment, but other trials will be made with barley meal, ground oats, and various other substances; and it is probable also that the cramming machine will be used at a later date.

RAIFFEISEN BANKS IN IRELAND.

The Eleventh Report of the Congested Districts Board for Ireland indicates that there are now 56 Raiffeisen Agricultural Banks in the congested districts, and that the Board voted during the year ending March 31st, 1902, the sum of £400 for the preliminary expenses incurred by the Irish Agricultural Organisation Soci ty in establishing them. The capital lent by the Board amounts to £3,200, and the banks have obtained £2,276 from other local sources.

The Report states that these sums, although small and falling short of the capital which could be beneficially employed, are not in fact so insufficient as might be supposed, for it is one of the principles on which these banks are constituted that they shall each work in such a small district that the members may all be known to one another. The financial success of the banks must be measured by the profits made by the individual borrowers and not by the gains credited to the bank.

Evidence of the benefits derived by the borrowers from the employment of the loans made to them continues to be highly satisfactory. The loans are usually invested in the purchase of calves, pigs, or sheep, and the profits made amount very frequently to as much as 50 or 100 per cent. The care with which loans are issued is shown by the fact that the banks suffer no losses from bad debts, and the Board have no doubt that they will gradually and surely acquire a stability and a position in public estimation which will enable them to obtain as much capital as they require, and that they will become less dependent on official support than they are at present in this respect. It is reiterated in the Report that these small societies have a social and educational value far in excess of the immediate economic gain which has invariably followed their formation.

INFLUENCE OF ENVIRONMENT ON THE CHEMICAL COMPOSITION OF PLANTS.

The Year Book of the United States Department of Agriculture for 1901 contains an article by Dr. H. W. Wiley, Chief

of the Bureau of Chemistry, on the influence of environment on the chemical composition of plants.

The word environment is used to include the soil in which the plant grows, the fertilizers which are added thereto, the character of the cultivation to which the crop is subjected, and the climatic influences during the year of growth. The study of the composition of cereals was begun as early as 1882 by Mr. Clifford Richardson, who not only endeavoured to collate the analyses made in other laboratories than those of the Division of Chemistry, but, on finding the results thus obtained unsatisfactory, arranged that Professor Blount should analyse the products of similar seeds grown in various parts of the United States.

The results of these investigations show that variations in the quality of the grain may be attributed to three principal sources.

(1) The inherent nature of the various species of wheat. Very little information is given on this point, but it appears that one class of wheat known as the Washington Glass variety gave on analysis only 11·86 per cent. of albuminoids, which even the soils of Colorado failed to improve. This wheat therefore shows a certain deficiency in powers of assimilating nitrogen, and it is generally admitted that the value of wheat for milling and bread-making purposes depends more largely on its nitrogenous contents than upon any other. It is true that starch is the most abundant constituent of wheat and offers the largest amount of nutritive food; but the protein, representing the principal part of the nitrogenous bodies, is the substance which gives the wheat its characteristic properties for bread-making, because in the protein are found those agglutinating constituents, together known as gluten, which render wheat flour so superior to the flour of other cereals for the purpose of panification.

(2) The second source of variation is the quality of the soil, and Mr. Richardson seems to believe that it is the most important factor in producing variations in the quality of wheat. The number of States in which experiments were conducted is not mentioned, but it appears that in 1882 it was found that the seeds of wheat of many different varieties, which were sent to be grown in Colorado, tended to produce a crop which was, on the whole, richer in nitrogenous matter or protein than the

original seeds, whereas the same seeds sent to Oregon, parts of California and North Carolina exhibited a tendency to produce crops in which the percentage of protein matter was decidedly lower than the original. "Of the 44 wheats from Colorado grown during two years only one fell below 11·5 per cent. of albuminoids, and only six below 12 per cent. Only two of this number weighed less than four grams per 100 grains. In North Carolina, on the contrary, 22 of whose wheats were analysed, only two exceeded 12 per cent. of albuminoids, while the weight of 100 grains averaged only as high as 3·776 grams. In Oregon another phase is presented. . . . Out of eight wheats which were analysed by us none contained more than 9·47 per cent. of albuminoids or weighed less than 4·253 grams per 100 grains. In Virginia a stunted wheat was found weighing only 1·830 grams per 100 grains, and yet having 14 per cent. of albuminoids."

(3) The third source of variation is the meteorological conditions, including the effects of the seasons and climate under which the crop is grown, and it is to this influence that Dr. Wiley is inclined to attach the greatest importance. After making due allowance for the fact that the experiments of a single season are not to be taken as final, he considers that there is a marked relation between the contents of protein matter and starch, and the length of the growing season. "It is evident that in countries where the period of growth is prolonged, as in the case of certain parts of the Pacific coast, and in the southern part of the country, there would be a tendency to increase the amount of starch in the grain at the expense of the nitrogen, while in regions of short growth, such as Minnesota, the Dakotas, Colorado, and the other northern latitudes where wheat is planted in the spring, there would be a tendency to increase the protein at the expense of the starch."

Under these circumstances Dr. Wiley suggests that in regions where it is possible spring wheats should be sown, and advocates the use of appliances, such as irrigation, fertilization, &c., which might tend to increase the nitrogenous matter by which wheat is as a rule rendered more valuable.

But in order that this result should not be effected entirely at the expense of the starch, he quotes an observation of Mr.

Dehérain (without, however, giving the reference), that in a certain year, the summer having been rainy with a low temperature, the ripening of the grain was retarded, and the analysis showed 12·6 per cent. of protein and 77·2 per cent. of starch from the wheat grown on the experimental farm at Grignon. In the following season, when July was hot and dry, the wheat ripened three weeks earlier, and contained 15·3 per cent. of protein and only 61·9 per cent. of starch. In this case, however, the quantity of protein per acre was about the same in the two harvests, but the percentage was greater because the quantity of starch was very much less than that produced in the first season. The rapid desiccation of the plant in the hot weather had arrested the elaboration of the starch.

SHEEP-BREEDING RECORDS.

Bulletin No. 95 of the Agricultural Experiment Station of Wisconsin University contains some interesting observations on sheep breeding, based on the records of the flocks at the Station, in which the Shropshire, Dorset, Southdown, Merino, cross-bred Shropshire-Merino, and Oxford breeds are represented.

The records appear to indicate that for such animals, and under the conditions prevailing at the Station, the normal period of gestation ranges from 144 to 150 days after the date of service, and that more ewes will lamb 146 days after service than at any other time. There appears to be no appreciable difference in the period of gestation for male and female offspring in sheep, but quick maturing breeds seem to carry their young for a shorter period than those breeds requiring more time to mature. The records also show that large lambs are, on the average, carried *in utero* for an appreciably longer period than small or medium lambs, and that lambs dropped before the 144th and after the 149th day of pregnancy are lacking in strength and vitality at birth. It was observed that Shropshire ewes were more prolific than any of the other breeds, except the fourth

cross of Shropshire rams on a Merino ewe foundation, twins being the normal increase for ewes of the mutton type.

It was also noticed that one-year-old rams were not so prolific as those of two or three years old. Ewes also averaged a larger percentage of increase in lambs after they reached full maturity at three years of age until after they were six years old, when the rate of increase diminished. The amount of service required of the ram in breeding seems to have an influence on the percentage increase in offspring of the ewes that produce lambs. Ewes bred early in the season of mating to a single ram dropped a larger percentage of lambs than those near the latter end of the season.

CO-OPERATION AMONGST DUTCH MARKET GARDENERS.

An interesting feature of the Dutch market gardening industry is the great extent to which co-operative principles have been applied to the sale of vegetables and fruit. All over North Holland the small market gardeners have formed societies for the joint sale of their produce, and in some districts they have erected their own auction halls. One of the largest of these associations is that known as the "Westland."

The Westland is a district between the Hague and Leiden, which is given up almost entirely to fruit-growing and market gardening. The usual size of the holdings is about five acres, though a few run to ten acres and upwards. Rents are high, averaging about £5 10s. per acre, and when there are glass-houses erected by the owner the gardener pays 5 to 8 per cent. yearly on the cost of erection. A short description of a market garden of 10 acres visited at Poldijk may serve as an example of the conditions existing in the Westland. In this case the occupier pays £5 17s. per acre rent, and he has 10 glass-houses on his holding, for which he pays 5 to 7 per cent. on the cost of erection. These glass-houses cost 15s. 4d. to 17s. 10d. per lineal foot to build, or when built against a wall, as is frequently the case, from 10s. to 12s. 4d. per foot. There is a polder tax of 13s. per acre on this holding, and the occupier also pays income tax. The soil is a clay loam, which

the tenant has improved by the addition of sand brought from the dunes, and by heavily manuring it with horse-dung. On this holding large quantities of grapes, melons, tomatoes, cucumbers, peas, beans, pears, plums, early cauliflowers, endive, and strawberries are grown. The tenant works himself from early morning till night, and employs five labourers, to each of whom he pays 18s. a week. He keeps himself, a wife and five children on the profits from the sale of his produce, but his outgoings for rent, labour, and manure are so heavy that the standard of living of the family is necessarily a low one.

To men in this position it is important that their produce should be sold to the best advantage, and to secure this result it is recognised that the quality of the articles produced should be maintained at a high level, and that the middleman should be as far as possible eliminated. It is with these objects in view that the Dutch market gardeners have combined for the joint sale of their produce, through the agency of co-operative associations, of which the Westland Society is one of the most successful.

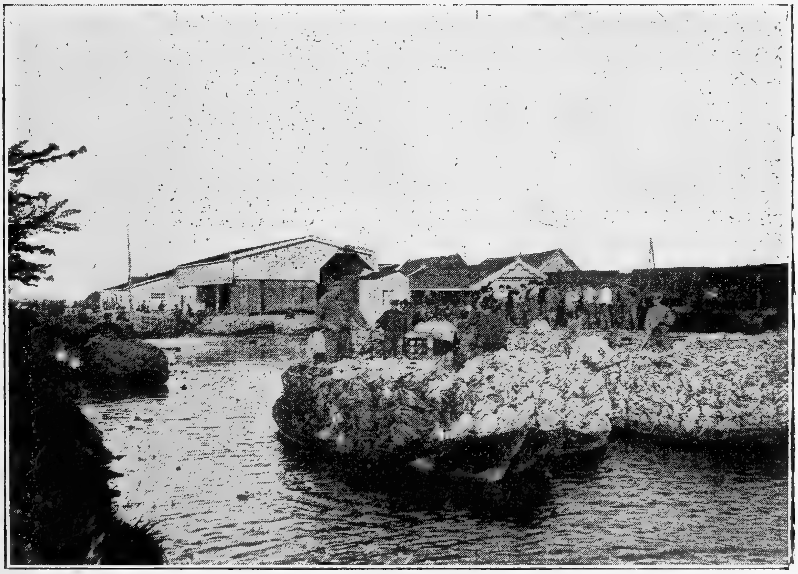
The object of the Westland Society, as set forth in its printed rules, is to promote the sale of market garden produce of the Westland by supervising the quality, quantity and packing of the produce, by holding auction sales, by exporting goods of first-rate quality to foreign markets in order to direct attention to the character of Westland market garden produce, by improving the systems of cultivation, and by taking any steps which will further the disposal of the crops.

The society has a registered trade mark in the form of a blue diagonal label, which each member is allowed to affix to the produce he brings to the auction; provided that the goods have been previously passed by the Committee, whose duty it is to see that they are properly packed, that the contents of the packages, bags, or baskets agree with the weight stated on the label, and that the articles are sound and of good quality throughout.

The Westland Society consists of a federation of seven branches, five of which have erected their own auction halls with borrowed capital, while in two cases the auctions are held in hired buildings. Sales are held every night in summer, three

times a week in the late autumn, and once a week in winter. These sales are largely attended by dealers and commission agents from Rotterdam, Amsterdam, the Hague and Delft, who arrange for the transport of their purchases to these towns, either for local consumption or for export.

Members of the society bring their produce to the auction hall in barges, and arrange their goods on the stands. When a large consignment of potatoes or other vegetables is offered for sale the purchase is made by sample, in other cases the dealer sees the entire lot of the articles he buys. Each lot of produce



Cauliflower Auction at Bovenkarspel.

to be put up for auction is entered on a delivery note by the member concerned, and this note is handed to the clerk, who subsequently passes it to the auctioneer. All goods purchased at the auction must be paid for in cash ; credit is seldom given. A purchaser is also required to leave a deposit to cover the value of the sacks, baskets, or other packages.

The auctioneer is in each case the president of the branch society. He receives nothing for his services, as the post is considered one of honour. The only paid officer of the society is the clerk.

The funds of the society are derived from a yearly subscription of 1s. 8d. per member, and from a commission charged on the amount realised for the goods sold. In the case of what are known as large auctions, which include large consignments of potatoes, Brussels sprouts, beans, peas, gooseberries, and plums purchased by sample, the commission is fixed at 1 per cent., and for small auctions or sales of small quantities of fruit, cucumbers, and other produce, 2 per cent. of the sale price is deducted.

The sum realised by the sales is distributed at the end of each week amongst the members who have sent goods to the auctions, each receiving the amount for which his produce was sold, less the commission mentioned above.

In 1901 the value of the market garden produce sold through the agency of the auctions held by the seven branches of the Westland Society amounted to £44,250.

Associations of the type of the Westland Society, though on a smaller scale, are to be found throughout the market garden districts of North Holland. Several of them are in operation in the Districts of Alkmaar and Bovenkarspel, and the greater part of the cauliflower and cabbage crops grown in the neighbourhood of these places is disposed of by co-operative auction sales in buildings erected by such societies. The principal object of them all is to sell the produce of their members to the best advantage, and to maintain the reputation of Dutch produce for uniformity of quality by the inspection and marking of goods offered for sale. Unsuitable produce is either rejected, or, if it is inadvertently passed by the examining committee, and a well-founded complaint is subsequently made by the purchaser, the producer is either compelled to take the goods back or to allow compensation to the purchaser on a scale fixed by the society. In the case of one co-operative auction mart near Bovenkarspel, a black board headed "Black List" is placed in a conspicuous position outside the mart, and on this the president of the society writes the name of any member who has endeavoured to pass inferior produce, and the name of any dealer who is in default with his payments.

At Bovenkarspel cabbages and cauliflowers are the principal products sold at the co-operative auctions. The mart is situated

on the bank of the canal, and the auctioneer sits facing the dealers in a small shed built on piles in the canal. The barges with cauliflowers or cabbages pass between the auctioneer's shed and the main building.

It is claimed for this system of co-operation that it has largely reduced the commission and charges formerly paid to middlemen, that it has served to keep up the standard of quality of Dutch produce, and it has prevented the undercutting of prices which arises when individual producers compete against each other in the same market. Goods sold under the registered trade marks have an established reputation at home and foreign markets, and the enforcement of a high standard of quality by the marking committees has made it difficult for an individual to spoil the market for his fellow-gardeners by "topping up" inferior produce or by giving short weight.

AGRICULTURAL EDUCATION IN HOLLAND.

According to a report on education in the Netherlands [Cd. 1,157] which has recently been published by the Board of Education, all agricultural affairs in that country are administered by one of the divisions of the Ministry of the Interior. To assist the Ministry, a central Council of Agriculture, composed of representatives elected by the various agricultural societies, meets periodically at The Hague, and practically nothing is done without the advice of this Council.

At the head of the institutions for agricultural education in the Netherlands stands the college at Wageningen.

Each of the eleven provinces has a State Professor of Agriculture, whose duties are to inspect and direct the five State experiment stations, give lectures, provide instruction for primary school teachers who wish to obtain an agricultural certificate, and inspect winter agricultural classes in receipt of a State subsidy. In the six provinces having State winter agricultural schools, the professor is also director of the school. Four of the provinces have State winter horticultural schools,

and in each of these provinces there is a State Professor of Horticulture, whose duties are, *mutatis mutandis*, similar to those of the Professor of Agriculture.

The six winter schools for agriculture are permanent institutions, quite distinct from the numerous winter classes, and are intended for the sons of farmers. The State bears all the expense connected with the maintenance of these schools, but the buildings were originally provided by the commune. The four State winter schools of horticulture and market gardening have each a large experimental plot provided by some private society. The State pays the salaries and fees of the staff, and makes a special grant of £125 per annum in each case in respect of the experimental work, but the buildings, as in the case of the agricultural schools, are provided by the local authorities.

There is no institution devoted exclusively to the teaching of dairying in the Netherlands, but the Dutch Budget for 1903 makes provision for the establishment of a State dairy school at Leeuwarden. There are, however, eleven provincial travelling Professors of Dairying, whose appointment is left to agricultural societies or special committees, but whose salaries are paid from State funds.

In addition to the instruction provided by the Dutch Government, a considerable amount of educational work is carried on throughout the country by agricultural and horticultural societies.

State agronomic stations have been established at different places for the purpose of analysing manures and food-stuffs, testing seeds, and for experimental and research work in dairying and agriculture.

UNITED STATES WOOLLEN INDUSTRY.

The Director of the United States Census has recently issued a Bulletin (No. 236), dealing with the wool consumption and supply of the States in 1900, together with comparative statistics for previous years.

The returns show that the number of establishments engaged in wool manufacture, including hosiery and knit goods, in 1900, was 2,335. The capital involved amounted to over £80,000,000, and the number of persons employed in the industry was 249,799, while the machinery in use included 6,605 cards, 1,451 combing machines, 3,511,099 spindles, and 74,190 looms. The chief seat of the wool manufacture is to be found in the north-eastern States, Massachusetts leading in 1900 with a product valued at £17,000,000, although it occupied the second position in 1890. Pennsylvania, first in 1890, was second in 1900, when its output of woollen goods amounted to £15,000,000 in value. Rhode Island was third in rank with a product somewhat less than half that of Massachusetts, followed by New York with a product not quite half that of Pennsylvania. Philadelphia, Lawrence (Massachusetts), and Providence (R.I.), are the chief wool-manufacturing towns in the States, their production in 1900 being valued at £12,000,000, £5,000,000, and £4,000,000 respectively. The figures for Philadelphia show a decrease of 23 per cent. as compared with the returns for 1890, but those for Lawrence indicate an advance of 145 per cent. during the decade.

The greater portion of the wool used in the manufactories is produced in the United States itself. The annual production of the wool shows great variation in recent years. In 1890 the quantity was 276,000,000 lb., and the returns for subsequent years showed an annual increase, until in 1895 the product was 309,748,000 lb. The next three years showed a steady decline, the total of 259,000,000 lb. in 1897 being the smallest production returned for any year since 1881. The census reports for 1900 show a product for the year of 277,000,000 lb. of fleece wool, to which must be added 33,000,000 lb., estimated as the quantity of pulled wool produced, making a total of 310,000,000 lb. Over 961,000 lb. of mohair, statistics of which were collected for the first time in 1900, were also produced, bringing the total of wool and hair to 311,000,000 lb. The exports of domestic wool during the year amounted to over 2,000,000 lb., while 128,000,000 lb. of foreign wool was imported for home consumption, so that there was a net supply of 437,000,000 lb. available for manufacturers, as

well as a considerable quantity of animal hair and shoddy. The fibre recovered from woollen, worsted, or mixed rags is known under the generic name of "shoddy," and is subdivided into shoddy, mungo, flocks, and wool extract, according to the material used and process of manufacture employed. It is used principally in the production of low-grade satinets and other heavy cotton-warp goods; the poorer qualities are used in backings for overcoatings and cloakings and to give weight and substance to various kinds of woollen goods. It is also used to some extent in the production of merino yarns for hosiery manufacture. The quantities of scoured wool, cotton, shoddy, and animal hair actually used in the woollen manufacture, exclusive of the hosiery and knit goods manufacture, in 1880, 1890, and 1900 are shown in the following table:—

<table>
<tr><th></th><th>1900.</th><th>1890.</th><th>1880.</th></tr>
<tr><td></td><td>Lb.</td><td>Lb.</td><td>Lb.</td></tr>
<tr><td>Scoured wool... ... ...</td><td>238,632,000</td><td>198,174,000</td><td rowspan="2">167,634,000</td></tr>
<tr><td>Camel's hair and mohair ... ...</td><td>5,584,000</td><td>9,411,000</td></tr>
<tr><td>Cotton and cotton yarn ... ...</td><td>98,633,000</td><td>94,372,000</td><td>58,482,000</td></tr>
<tr><td>Shoddy ... ...</td><td>71,497,000</td><td>56,826,000</td><td rowspan="2">56,971,000</td></tr>
<tr><td>Animal hair not specified ... ...</td><td>29,085,000</td><td>16,852,000</td></tr>
<tr><td>Total ... ...</td><td>443,431,000</td><td>375,635,000</td><td>283,087,000</td></tr>
</table>

The percentage of scoured wool, including camel's hair and mohair, to other fibres used in all branches of the wool manufacture was 59·2, 55·3, and 55·1 in 1880, 1890, and 1900 respectively. Cotton, which includes the cotton yarn used, comprised 20·7 per cent. in 1880, 25·1 per cent. in 1890, and 22·2 per cent. in 1900 of the consumption; while the proportion of shoddy and animal hair used was 20·1 per cent. in 1880, 19·6 in 1890, and 22·7 in 1900.

The average cost per lb. of scoured wool consumed in the wool manufacture in 1900 was 1s. 7d., as compared with 1s. 11d. in 1890 and 2s. 4d. in 1880. The most expensive wools were bought by the worsted mill owners, the average price paid by them in 1900 being 1s. 9d. per lb., while the cheapest wools were sold to carpet manufacturers at an average price of 11d. per lb.

No particulars are given as to the countries of origin of the imports of wool entered for consumption, but such information is available in the case of the total imports of wool, whether entered for consumption or not. The total quantity of wool received in the United States in 1900 amounted to 153,000,000 lb., as compared with 103,000,000 in 1890. The wools are classified in three qualities in the returns, Classes I. and II. being those employed in the general wool manufacture, while Class III. are coarse wools used principally in the manufacture of carpets. Mohair and alpaca are included in the Class II. wools, and camel's hair is divided between Classes II. and III., according to the quality.

Nearly 106,000,000 lb., or 69 per cent., of the wools imported in 1900 were classed as third quality. Of this total China sent 31,000,000 lb., European Russia 13,000,000 lb., and the United Kingdom 12,000,000 lb., India and Argentina being the next important contributors with 9,396,000 lb. and 8,951,000 lb. respectively. The wools of Class I. come most directly into competition with the wools of domestic production, the quantity imported in 1900 being 37,000,000 lb., or more than double the quantity received in 1890. For many years American importations of such wools have been mostly of Australasian growth, and in 1900 nearly 23,000,000 lb. of first grade wools were received from this source. In recent years, however, large quantities have also come from the Argentine Republic, which sent 11,000,000 lb. in 1900, as against only 168,000 in 1890.

In the imports of Class II. wools, the returns show but little change since 1890, the total quantity imported in 1900 being 9,885,000 lb., or only 2,226,000 lb. in excess of the importations in the former year. The United Kingdom was the chief source of supply, furnishing 7,805,000 lb. of the total, as compared with 6,897,000 lb. in 1890.

THE MEAT INDUSTRY IN THE UNITED STATES.

In earlier numbers of this *Journal** an account has been given of the prospects of the cattle industry in the United States

* Vol. III., December, 1896, p. 257, and Vol. V., December, 1898, p. 343.

from reports furnished by Mr. O'Beirne, of H.M. Legation at Washington, to the Foreign Office. It will, therefore, be of interest at the present time to give some later information on this subject from a report on the meat industry of that country, viewed in the light of the results of the recent census of domestic animals* in the United States, which has just been sent to the Foreign Office by Mr. Erskine, Acting British Consul at Chicago.

The present supply of beef cattle is estimated at some 27,610,000, while in 1892, when the highest point was reached, they numbered some 37,651,000, since which date they have steadily declined.

The census figures give the supply of all cattle in the States as 69,439,000, of which number nearly 30,000,000 were dairy or other cows, over 12,000,000 beef steers, 7,000,000 heifers, and over 15,000,000 calves. These figures seem to show that the average increase is about 15,000,000 a year.

About 1,500,000 beef steers are killed at the age of two, 2,000,000 between two and three, and about 3,000,000 are left over that age. Over 1,000,000 calves are slaughtered annually, and only about half of these are killed in the regular large slaughter-houses, the others being killed by small butchers or farmers, and often sent to commission agents in the cities for sale.

Among the sheep the majority that come to the market are lambs, and it is found most profitable to force the lambs by heavy feeding, and dispose of them early.

It is a very great question if the supply from the ranges can be increased in the future. Many of the ranges have been over-stocked, have suffered from drought or from fire until the native grasses are nearly extinct, and as yet no grasses have been found to satisfactorily replace them. The cattlemen are complaining of the encroachments of the sheepmen on the public ranges which they have long used; and in Wyoming, which a few years ago was entirely a cattle State, there are now under 700,000 cattle and over 5,000,000 sheep. The sheep move in large flocks and eat the grass so close that

* *Journal*, Vol. IX., June, 1902, p. 56.

the range does not recover for some years, and in many cases fires, disastrous to all ranging interests in the State, have been started through carelessness.

The prices of fat stock show a considerable rise in 1902 over the previous year, but animals for stocking have shown little or no improvement in price. There was a great shortage in the maize harvest of 1901, and farmers found it more profitable to sell their corn than to use it for food, its price in 1902 having been about double that of 1901. As a result, animals ready or nearly ready to kill have been scarce. It is stated that it is only the best-fed cattle that can be exported and bring in any return, although the exporters maintain that there is very little profit in the business. The prices of maize-fed cattle range higher than fat grass-fed beasts, hence the market depends chiefly on the cattle fed in the maize-growing States. Corn can only be grown on a limited area, which can, however, be increased to some extent, and no roots are grown for feeding purposes, although some cattle are fed on the refuse of the beet-sugar refineries.

There are 61,606,000 sheep in the United States, the North Central and Western States containing over 80 per cent. of the number. Thus the grazing States have by far the largest supply, so that with the growing restrictions on grazing on public lands, it is doubtful if the number of sheep will ever be so great again.

About two-thirds of the hogs in the United States are in the North Central States, the corn-growing ones, and are fed economically with the corn-fed cattle. Their average weight has run about 10 lb. lower than usual this year, and many underfed hogs have been sent forward. Some complaints are made that the hogs are reduced in size and strength by a system of breeding very young and selling the sows after two or three litters, and it is said that this system is undermining the strength and breeding powers of both sexes.

There are numerous stock yards situated all over the States, which are often really collecting places for animals to be sent to the feeding districts, although some cattle are bought for killing at most of them. The principal stock yards are at the big slaughtering centres—Chicago, Kansas City, Omaha, St. Louis, and St. Joseph.

A stock yard to be really successful must be near a cattle-feeding district, that is, within 24 hours' rail, where the supply of fat stock is plentiful, and where there is a demand for feeders.

The Chicago yards cover 500 acres, of which 420 acres are paved with vitrified brick and well drained. Overhead passages convey the cattle to the packing houses, and there are 13,000 open and 8,500 closed pens. The yards have a capacity of 75,000 cattle, 300,000 hogs, 80,000 sheep, and 6,000 horses (in stables). Most of the animals consigned to the yards are sent to commission agents, who sell to the packers, butchers, exporters, speculators, or feeders.

On arriving at the yards, the cattle are inspected, and all animals that show signs of tuberculosis by coughing, advanced pregnancy, recent calving, lumpy jaw, or extreme emaciation, are killed under special examination by the United States veterinary inspectors; if found healthy, they are passed, and if unsound, are skinned and the carcase placed in a tank. Account is kept of the value of the hide and other products. Sheep are examined and rejected for scab and for the same reasons as cattle, but few are diseased. Hogs are penned and sold to the packers, butchers, or speculators. The hogs are then driven past the Government inspectors, who condemn any they think ailing or diseased. These are locked in pens for more critical examination after the rush is over. They are then weighed, and the weight recorded, and the payment is by this weight. They are then driven on towards their packing house.

In Chicago about one-third of the cattle, one-sixth of the hogs, one-tenth of the calves, and one-seventh of the sheep are sent out of the market, either further east for slaughter, for export, or as stock for farmers.

According to the recent census, there were in 1899 in the United States 921 slaughtering establishments, in which 5,514,000 beeves, 898,000 calves, 9,176,000 sheep, and 30,619,000 swine were slaughtered during the year. Of the total number of establishments, 348 were engaged in slaughtering only, but in the remaining 573 the meat was packed as well. The census returns made by packers indicated that their aggregate annual expenditure amounted to £150,000,000, while their receipts were £124,000,000 for meat, and £33,000,000 for by-products. In

other words, the packer would make a loss if the meat were the only produce of the animal. His profits are all derived from the utilisation of the by-products.

The meat packing business is one that has grown to an enormous size in the last few years, and has practically driven the butchers, as slaughterers, out of all towns in the United States, where the butcher is now simply a retailer of the goods sent to him in refrigerator-cars owned by the packers or wholesale butchers. No butcher can compete with a modern packing-house where everything is utilised (except the gastric juice), and where the profit is made and expenses paid out of the by-products, which are practically an expense to the small butcher. These packing-houses deal in all sorts of by-products, as well as in meat, poultry, apples, vegetables, butterine, and eggs, as they have cold storage of their own, and men in the country who can buy other things besides cattle for them.

Many of these large packing-houses have been shipping cattle on the hoof, but this trade has been far from profitable lately, as the United Kingdom will only take the best, and these are in very short supply here.

BY-PRODUCTS OF THE MEAT INDUSTRY.

As noted in the article on "The Meat Industry of the United States" (p. 384), the whole of the profits of the great meat packing-houses in the United States are derived from utilising the by-products of the slaughtered animals. None of the packing-houses, not even the largest, handle all these products themselves, but sell the raw material to other firms, although they have often a large interest in the factory.

From these by-products, most of which are wasted by small butchers, the following articles are made:—Albumen is made from the blood, and is used for calico printing, tanning, and sugar refining. The blood is congealed into buttons, and also

used in making extract of beef and fertilizers. The leg bones of the cattle are used for making tooth brushes and knife handles, chessmen, mouthpieces, and screws for joining the mouthpiece to the stems of pipes and buttons; some bone refuse is ground to flour and made into billiard balls and buttons; bones from the cooked meat are boiled and the fat and gelatine extracted, and all other bones are ground into fertilizers. Horns are made into buttons, combs, brushes, and pipe mouthpieces, and the refuse into fertilizers. Hoofs are made into buttons, cyanide of potassium, and fertilizers; a large export trade in hoofs was formerly done with Japan, but a heavy duty stopped it. Gelatine and glue are extracted, by boiling, from the soft bones of the head, shoulders, ribs, breast and cores of the horns, but the scraps from hides, especially those of calves, are great gelatine producers; glycerine is obtained from the "tank water," which is left after the removal by boiling, under pressure, of the grease obtained from scraps of meat, bones and intestines. Neats foot oil is extracted from the feet. Oleo oil is made from the fat of cattle, and is practically refined tallow.

Of all these by-products the most important for the packing-houses to handle themselves are those dealing with the perishable parts, such as the intestines, glands, fat, &c. These often have to be treated chemically, and experiments are continually being made to find new results and lessen the cost of output. Many of these methods are secrets of the firms employing them.

The beef fat is gone over very carefully, and selected into two grades for oleo oil making. It is then chopped up very fine by a hasher, working at the rate of 600 revolutions per minute. There are many different kinds of machines, but all are designed to cut the fat up very small without bruising it. The chopped fat is then put into large kettles, set level with the floor, and the contents are boiled, being kept continually stirred by an agitator. When the liquid has been thoroughly cooked, it is drawn from the top and placed in another kettle, to settle and clarify. It is then placed in shallow pans with a cloth in each, and put in a press, and the whole is subjected to a pressure of 250 lb. to the square inch. The oleo oil is generally subjected to two pressures, and the stearine, which is left in the pans, is made into cakes. The stearine is, generally, white, and is used for making

candles, chewing gum, &c. The oleo oil is barrelled for shipment or used for making butterine. When used for this purpose, it s mixed with cottonseed oil and milk (in the best grades 40 per cent. of fresh cream is used) and in some cases with beef lard. The refuse from the first boiling is pressed into cakes and sold as chicken food. Hog fat is treated in the same way as to hashing and cooking, but has to be continually stirred while cooling ; it is then filtered and run into a trough, where it is collected by a cooling cylinder, that is, a cylinder with a cold water jacket revolving in the trough, to which the lard adheres. The lard is scraped off, and is filled by a pump or from an agitator, to prevent lumps forming, into cans or pails.

Soap is an industry in which the packers have made a great success, and of which they will probably soon have control.

The hides are nearly all sold to tanners, either directly or through brokers, but some of the packers have interests in large tanneries, and send most of their hides to them.

[*Foreign Office Report, Miscellaneous Series, No.* 581.]

UNITED STATES IMITATION BUTTER LEGISLATION.

Regulations have been issued by the United States Secretary of Agriculture, under the terms of the Act noticed in the last number of the *Journal* (p. 251), providing for the inspection of "renovated" butter and prescribing the manner in which it is to be marked.

The "packing stock," or material from which renovated butter is made, the factories, the methods of making, and the finished product, are subject to rigid sanitary inspection. Before leaving the factory the article must be marked, and the law provides that it shall not be transported to any foreign country until it has been so marked.

Accordingly, the rules now in force require the words "Renovated Butter" to be stamped in large indented letters

on the substance itself, whether packed in mass, in box or tub, or in the form of prints, bricks, or rolls. The same words on a printed notice are to be affixed to every manufacturer's package "in plain gothic letters at least three-eighths inch square." There is also to be attached to every original package a Government revenue stamp on which the same words appear in conspicuous type. This stamp bears the name of the State in which the renovated butter was made, the registered number of the factory, the number of the revenue district, and a date closely approximating that of manufacture. These stamps and labels are protected by strict laws from removal, obliteration, and alteration. If the contents of the manufacturer's stamped package is divided into parts or parcels, all interior wrappings and packages must be likewise conspicuously marked "Renovated Butter."

The law and regulations provide that renovated butter shall be absolutely free from fat other than butter-fat, and from all substances foreign to natural butter, and that its moisture content shall be less than 16 per cent.

Although the Government of the United States does not attempt to inspect and test every lot of renovated butter made, or every shipment abroad, it is intended that the law shall be so administered that all such butter, duly marked and stamped, may be presumed to be unadulterated and free from excess of water, and that all renovated butter hereafter exported shall leave the country with the marks, stamps, and labels described, thus clearly indicating its true grade or character. So long as the stamps remain upon the packages the time and place of manufacture can be fixed; and, should adulteration or illegal condition be proved, the manufacturer will be held responsible by the United States Government.

Large quantities of renovated, or "process," butter have been exported from the United States in recent years to Great Britain and other countries. It has often occurred that this grade of butter has been sold as "dairy," or "creamery," butter. This kind of deception has been detrimental to the reputation of American creamery butter and the best dairy interests of that country. The new law aims at preventing such misrepresentation, and insuring the commercial identity of the

article in question. This identity will be preserved and protected in the case of all renovated butter hereafter exported, as far as the jurisdiction of the United States extends.

Importers and merchants in other countries who may handle this class of butter are respectfully solicited to co-operate with the United States Department of Agriculture in preserving and protecting the official markings, and thus to assist in this effort to secure honesty in trade in this particular line of dairy products.

MILLING INDUSTRY OF THE UNITED STATES.

The most rapid increase in the establishments engaged in milling cereal products in the United States took place in the period 1860-70, when the number rose from 13,868 to 22,573. Between 1880 and 1890 there was a very marked decrease in the number (from 24,338 to 18,470), due, not to any diminution in the importance of the industry, as appears from the amount of capital invested, but rather to the tendency to combine many of the smaller mills into single large establishments. During the last decade, on the other hand, there was again a large increase in the number, the total in 1900 standing at 25,258. Not only were many larger mills built, but there was also a considerable increase in those of smaller capacity.

The capital invested, calculated at £45,565,000, showed only a small increase over the previous investigation, while the number of wage-earners and the total wages paid diminished very considerably, owing, principally, to improved processes in handling the grain and products, which lessened the amount of manual labour required. The average wage, however, showed a rise. The average number of wage-earners in employment was 37,073 in 1900 as compared with 47,403 in 1890.

In spite of a fall in the price of cereals during the decade, the total amount paid for the raw materials increased by 9·6 per cent., because of the greater quantity used, while the value of the products increased by 9·1 per cent. The value of the products in 1900 amounted to £116,816,000, and the chief items of expenditure were: cost of raw materials, £99,130,000; salaries, £1,126,000; wages, £3,688,000; and miscellaneous expenses (including rent, taxes, &c.), £2,151,000. The difference between the total of these items and the value of the final products, however, must not be taken as indicative of the profits of the manufacture, since the census takes no cognisance of the cost of selling manufactured articles, interest on capital invested, mercantile losses, or depreciation in plant.

Considering only the flour and grist mills grinding wheat, the total number in the United States was 13,188, of which 1,655 belonged to the extremely small class producing less than 100 barrels (19,600 lb.) of flour annually, while 135 produced more than 100,000 barrels of flour.

The great centre of the wheat-milling industry is Minnesota, from every point of view except that of mere number of establishments. From the latter point of view, Pennsylvania, with 1,580 mills, ranks first, but they are of relatively small capacity. Minnesota has, in fact, only a comparatively small number of mills, but over 60 per cent. of them are of large capacity, producing over 5,000 barrels of flour annually, and 24 mills in this State produce over 100,000 barrels each. In point of quantity of wheat used Minnesota is followed by the States of Ohio, Indiana, Illinois, Missouri, and New York, in the order named. The value of Minnesota's production of wheat and other flours was 14·1 per cent. of the total, New York's 7·6 per cent., and Ohio's 6·7 per cent.

Of the total value of products in 1900, wheat flour constituted 62·1 per cent., as compared with 68·3 per cent. in 1890; while maize meal accounted for 13·1 per cent., as compared with 14·9 per cent. in the earlier year. Nevertheless, the quantity of the wheat flour produced increased by 26·7 per cent., and that of maize meal by 8·5 per cent. Buckwheat and hominy increased in both quantity and value.

The following table shows the quantity of materials used

and the amount of flour and other products produced in 1900 and 1890:—

	1900.		1890.	
	Grain used. Bushels. 000 omitted.	Flour produced. Cwts. 000 omitted.	Grain used. Bushels. 000 omitted.	Flour produced. Cwts. 000 omitted.
Wheat	489,914	179,417	385,750	141,660
Maize	241,029	70,063	166,293	64,571
Rye	12,721	3,044	12,140	3,740
Buckwheat	8,317	1,907	7,032	1,611
Barley	12,289	890	8,696	2,900
Other Grain...	70,873	—	47,104	—
Hominy	—	2,730	—	2,052
Offal	—	58,570	—	62,517
Other Products	—	£18,214	—	£6,798

The most interesting feature of the returns is the large amount of material (chiefly barley and maize) which is no longer ground for flour, but is turned out as "feed." This "feed" amounted in 1900 to 89,833,000 cwt. (valued at £16,947,000), and accounted for nearly all the "other products" in the above table. The corresponding quantity produced in 1890 is not given.

DAIRY INDUSTRY IN MAINE.

According to the United States census, there were 173,592 dairy cows on 49,161 farms in the State of Maine in 1901. The total amount of milk produced was 99,586,188 gallons, or an average of 573 gallons per cow, *i.e.*, a little over 6½ quarts per day per cow, supposing the animals to have been in milk during the whole year. There were manufactured on the farms 16,174,173 lb. of butter, and 425,102 lb. of cheese, of which 11,030,091 lb. and 365,936 lb. respectively were sold. The value

of dairy products consumed on the farms amounted to £512,228, and the total value of all the dairy products of the State is given as £1,636,467 for the year.

The large increase in the dairy trade in recent years has tended towards combination, and there are now in the State 54 "dairies," of which 14 are strictly "butter dairies." These 14 dairies manufactured 895,000 lb. of butter in 1901, or an average of 161 lb. per cow, and the average price obtained was 11¾d. per lb. The butter yield per cow at the different dairies ranged from 103 to 267 lb.

Twenty-three dairies which make butter and also sell cream had a return of about £8 15s. per cow. The average value of the cream sold was 2s. 9d. per gallon, but several dairies obtained 4s., and one dairy 6s. per gallon, the price being governed by the percentage of butter-fat. The Jersey cow is the favourite for dairy purposes.

The labourers employed in 38 dairies receive average wages of 5s. 7½d. a day. The collectors are paid by the month; those furnishing their own team get £6 a month, but if the dairy furnishes the team they receive £4 to £5. One dairy, which employs 160 labourers, pays them uniformly £10 a month, the entire wages for the year amounting to £19,200.

Whilst there were 60 cheese factories in the State twenty-five years ago there are now only 16 in operation. Eleven of the factories are co-operative and five proprietary. The capital invested aggregates £6,766. The whole product of the 16 factories in 1901 was 562,775 lb. of cheese, for which an average of 5½d. per lb. was received. The wages of the 47 operatives in the cheese factories, including the milk collectors, are about the same as in the creameries, that is, generally from 7s. 3½d. to 8s. per day, while collectors receive from £4 to £6 per month. The market for the cheese manufactured is mostly local, and the supply is not equal to the demand.

The condensed milk industry was first established in Maine in 1891 by a company, which packed 2,160,000 cans of condensed milk, valued at £30,000, in 1899. The number of operatives is 28; the men receive £2 2s., the women £1 4s. per week.

[*Foreign Office Report, Miscellaneous Series, No.* 584.]

MEXICAN DEMAND FOR PURE-BRED CATTLE.

In Bulletin No. 41 of the Bureau of Animal Industry of the United States Department of Agriculture, attention is called to Mexico as a market for pure-bred beef cattle.

It is pointed out that, previous to the passage of the United States Tariff Act of 1897, a large number of the surplus cattle from the ranches of the Mexican border States found a market in the United States, whence they were taken for pasturage in dry seasons and for feeding. The increased tariff on cattle imposed by the 1897 Act considerably reduced these importations, and Mexican ranch owners are now looking to the United Kingdom and other countries as an outlet for their animals. The native breeds are, however, of too small a size to compete in such markets, and breeders are, consequently, importing bulls of the well-known beef breeds to build up the native stock. In 1900 over 3,000 cattle were imported from the United States, all of them being probably breeding animals, while a number of animals were also imported from Switzerland. The Mexican cattle raiser is not willing to give exorbitant prices for breeding cattle, partly owing to the fact that so many inferior animals have been imposed on him as pure-bred. It is, therefore, suggested that it may be the best plan for breeders to reduce the prices of animals for export to Mexico until such time as the Mexicans may become convinced that the cattle sent them are all that is claimed for them, and that such cattle are indispensable to the success of the object which they have in view. Cattle sent to the low-lying portions of Mexico are liable to infection from the Texas fever, which is prevalent there, but the more elevated portions of the Republic are apparently free from infection. Mexican buyers desire to see the animals before purchasing, and it is accordingly suggested that cattle should be exhibited at all the principal fairs held in the Republic, and also at the larger cities. All literature of an advertising character which is sent to Mexico should be printed in Spanish.

EGG PRODUCTION IN NORWAY.

The Board have received through the Foreign Office a copy of a memorandum prepared by Mr. C. S. Dundas, H.M. Consul-

General at Christiania, upon the production of eggs in Norway, who states that poultry-keeping in Norway has made considerable strides in the last year or two. There are no statistics prior to 1891, when the number of fowls in the country was estimated at 796,563; but in 1900 this had risen to 1,636,543. Stavanger district stands first in this respect, with an increase from 93,000 to 309,000 in the decade. The town of Stavanger is the great egg centre; but so far there has been little export.

The increasing importance of the industry may be gathered from a consideration of the fact that in 1890 there were 493 fowls per thousand inhabitants, while in 1900 there were 987. Furthermore, the imports of eggs into Norway show the following drop during the last five years:—

1897	24,648 cwt.
1898	15,364 "
1899	11,468 "
1900	4,244 "
1901	3,429 "

From information to hand concerning this year's production, this importation may shortly be expected to be transformed into an exportation. Between 1896 and 1900 the average yearly export has been 29 cwt., and in 1901 it was 170 cwt. And as Great Britain's consumption of imported eggs has risen steadily, until it now amounts to nearly £5,500,000, Norway hopes to be able to capture some of the trade. But methods of sorting, packing, numbering, &c., will have to be carefully studied.

The *Aftenpost*—a Christiania journal—has lately contained a few remarks on the progress made in poultry-farming in Norway which may be accepted as substantially correct.

In Levanger district the average price obtained by the peasants for their eggs in 1901 was 78 öre per kilogram (about 4½d. per lb.). Between 1899 and 1901 the annual supply in this district had risen from 62,000 to 112,000 eggs.

Voerdalsören sells chiefly to Christiania. The average price in 1901 was 93 öre per score—just over a 1s. The value of the eggs sold rose from £350 to £940 between 1898 and 1901.

Orland likewise sells to Christiania; but Christiansund, N., and Trondhjem also take their share for hotels and tourist ships. The average price last year was 1s. per score. The production

in this district is considerable and also instructive. The inhabitants number about 3,000, yet the value of their egg sales was £3,200, and this despite the unfavourable climate of the place, where no trees will grow, and the summers are so cold that fires are said to be generally necessary.

Of late there seems to have been a movement among British importers to look to Norway for additional supplies of eggs, and it seems quite possible that in the next few years a trade may spring up in this direction.

AGRICULTURAL CO-OPERATION IN BAVARIA.

At the annual general meeting of the German Agricultural Co-operative Societies, held at Munich last year, Baron von Soden Frauenhofen, the President of the Bavarian Union of Agricultural Co-operative Societies, presented a report on the progress of agricultural co-operation in Bavaria.

According to this report the first agricultural co-operative institutions—Raiffeisen Banks—were started in Bavaria in 1877. In 1881 there were forty-two such societies in the country. In 1901 there were 2,600, with 171,000 members. In the early nineties the inconvenience of the want of a central organisation for the multiplying societies began to be felt, some belonging to the Raiffeisen organisation at Neuwied, some to the Offenbach organisation, and some standing alone or in smaller independent unions. The Bavarian Government, about the same time, decided that the movement was one deserving of State help. At the end of 1893, a Bavarian union of agricultural loan bank societies was formed, affiliated to the Offenbach—now General (Darmstadt)—Union, and at the same time the Bavarian Central Loan Bank was started with financial aid from the State. This took the shape of a free grant of £5,000 and a deposit of a further £5,000 in scrip. In 1898 a further free grant of £5,000 and an advance at 3 per cent. of £95,000 were made, and in 1900 an additional sum of £100,000 at 3 per cent. was advanced.

Certain advantages as regards interest on secured overdrafts on the Royal Bank were also granted to the central co-operative bank to help it through its first years. These privileges ceased on January 1st, 1902, when the bank was expected to be in a position to hold its own without further special favours. In 1894 forty-eight societies were affiliated to the central bank. In 1901 there were 1,645 affiliated societies, the value of whose collective credit was estimated at £147,250. The progressive character of the business transacted by the central bank is shown by the following extract from one of Baron Soden's tables :—

——	In 1894.	In 1900.	Up to June 30, 1901.
	£.	£.	£.
Paid in by members	101,092	1,092,696	533,986
Paid out to members... ...	123,626	1,118,724	621,200
Effects...	—	115,403	115,403
Total turnover	396,071	4,295,619	2,750,000

A branch of the Neuwied (Raiffeisen) Central Bank was established in Nuremberg in 1895, independent of the Bavarian semi-State bank, and in 1898 counted 314 affiliated societies, doing business to the extent of £489,843 turnover. There are some other minor institutions of similar character.

Besides these institutions for the organisation of personal credit, an important step in the organisation of real credit was taken in 1896 by the establishment of a mortgage debenture association on co-operative principles, having in circulation last year mortgage debentures to the amount of £1,366,635.

The most important operations of agricultural co-operation in Bavaria are concerned with the organisation of agricultural credit, but agricultural co-operative societies are also doing business in the wholesale purchase of seeds, manures, feeding-stuffs, and machinery and implements, to the extent of £503,493, and in the co-operative sale of produce to the amount of £313,905. There are 150 dairy societies, and sundry special co-operative societies for the sale of fruit, hops, wine, tobacco, and other products; also 11 important and 976 minor co-operative cattle-breeding (bull) associations, 86 pig-breeding associations, and 140 boar-keeping associations, besides sundry associations on co-operative principles for drainage and irri-

gation, for steam threshing, and for mutual insurance of all kinds, including cattle insurance.

Department of Agriculture and Technical Instruction for Ireland, Bulletin No. 2, Miscellaneous Series.]

Canadian Fruit Marks Act.

Under the Fruit Marks Act, passed by the Canadian Legislature last year, as amended by an Act which received the Royal Assent in May last, all closed packages of fruit intended for sale must be marked in a plain and indelible manner with the packer's name and address before they are taken from the premises where they are packed; the name of the fruit must also be given, as well as a designation of the grade of fruit, which shall include one of six marks. Fruit of the first quality is to be marked No. 1, or XXX; fruit of the second quality, No. 2, or XX; and fruit of the third quality, No. 3, or X; but the said mark may be accompanied by any other designation of grade, provided that designation is not inconsistent with, or marked more conspicuously than, the prescribed mark. No closed package of fruit must be marked "No. 1" or "XXX," unless such fruit consists of well-grown specimens of one variety, sound, of nearly uniform size, of good colour for the variety, of normal shape, and not less than 90 per cent. free from scab, worm holes, bruises and other defects, and properly packed. Packing in which the faced or shown surface gives a false representation of the contents of the package is also prohibited. Should an inspector under the Act find that a package is falsely marked or packed, he is required to mark the words "Falsely Marked" or "Falsely Packed" on the package, after notifying the packer.

Export of Channel Islands Cattle to United States.

The Board of Agriculture have received a copy of an order issued by the Department of Agriculture of the United States on the 25th ult., which provides that cattle imported into the United States directly from the islands of Jersey and Guernsey may be admitted without being tested by tuberculin.

Conveyance of Cattle to Jamaica.

The Board are informed by Messrs. Elder, Dempster & Co. that they are anxious to increase the export of pedigree live stock from the United Kingdom to Jamaica, with the object of improving the breed of horses, cattle and sheep there; and that they are therefore willing to carry, freight free, by the Imperial Direct West India Mail Service, all such animals as may be offered during the next three months. Cattle boxes, food, and attendance must be arranged for by the shippers.

Dairy Exhibition at Hamburg.

The Board have received information through the Foreign Office that, from May 2nd to May 10th next year, a general exhibition, illustrating hygienic milk supply, will be held at Hamburg, the aim being to exhibit to the consumer the production and supply of milk from an agricultural, technical, scientific, and hygienic point of view. During the exhibition a course of lectures will be delivered, which, it is hoped, will offer many points of interest to scientists.

Land Settlement in the Transvaal

The Board have received a copy of a publication issued by the Transvaal Department of Agriculture, entitled *Handbook for Settlers*, containing advice for the use of persons taking up land for agricultural purposes in that Colony. Detailed information is supplied concerning farming, stock breeding, horticulture, and other matters of interest to agriculturists.

HARVEST AND CROP REPORTS.

Crops in the United States.

The October and November numbers of the United States *Crop Reporter* contain preliminary estimates of the average yields per acre of the principal cereal crops in the past season. The area under these crops was given in earlier issues, and the following data as to the approximate total productions have been obtained by multiplying their estimated yields by the area.

The total area under wheat in the United States this year is returned at 44,000,000 acres, or about 6,000,000 acres less than last year. Partly owing to this decrease, and partly to a smaller average yield per acre, the total wheat harvest works out at only about 626,000,000 bushels, as compared with 748,000,000 bushels last year.

The area under maize was 95,000,000 acres, and the total yield amounted to about 2,500,000,000 bushels, being the largest crop on record. Nearly 29,000,000 acres of oats, 5,000,000 acres of barley, and 2,000,000 acres of rye were also grown, while the total yields amounted to 989,000,000 bushels, 135,000,000 bushels, and 34,000,000 bushels respectively, these figures indicating increases in each case over last year's crops.

The French Harvest of 1902.

The following table, which has been compiled from figures published in the *Journal Officiel* of 4th and 24th October, shows the preliminary official estimate of the area and production of

each of the principal corn crops in France for the past season, with comparative figures for 1901 :—

Crop.	Area.		Production.	
	1902.	1901.	1902.	1901.
	Acres.	Acres.	Bushels.	Bushels.
Wheat	16,833,000	16,770,100	351,989,700	294,808,300
Mixed Corn ...	468,000	487,500	8,728,800	8,615,400
Rye	3,466,500	3,442,700	49,904,800	60,438,100
Barley	1,882,900	1,948,700	45,718,600	37,682,200
Oats	9,851,000	9,549,300	286,142,400	207,002,400

CROPS IN HOLLAND.

According to information received through the Foreign Office, the corn harvest in Holland this year gave fairly good results, both as regards quantity and quality, except in the case of oats and peas, which are described as only slightly over average. Potatoes and sugar beet are also stated to have produced rather over average crops, while the yields of hay, flax, mangolds, and carrots were fairly good. The production of apples was an average one, but pears and cherries were under average, while plums were the least satisfactory crop of the year.

THE NORWEGIAN HARVEST OF 1902.

The Board have received information through the Foreign Office that the corn and fodder crops in Norway show a very considerable deficiency this season. The frost came early and nipped the corn while still green, so that the crop in many localities never ripened at all. Potatoes also, according to the latest reports, promised fairly, and the hay harvest was also moderately satisfactory in the northern districts.

QUEENSLAND AGRICULTURAL STATISTICS.

The following table, which has been compiled from figures given in the Report of the Registrar-General for Queensland on Agricultural and Pastoral Statistics for 1901, shows the area and production of certain of the principal crops and the number of live stock in the Colony for 1900 and 1901 :—

—	1901. Area.	1901. Production.	1900. Area.	1900. Production.
	Acres.	Bushels.	Acres.	Bushels.
Maize	116,983	2,569,118	127,974	2,456,647
Wheat	87,232	1,692,222	79,304	1,194,088
Barley	11,775	277,037	7,533	127,144
Oats	1,535	42,208	385	7,855
		Tons.		Tons.
Potatoes	13,338	39,530	14,674	38,214
Hay (all kinds) ...	63,055	122,039	42,497	78,758
	No.		No.	
Horses	462,119		456,788	
Cattle	3,772,707		4,078,191	
Sheep	10,030,971		10,339,185	
Pigs	121,641		122,187	

PARLIAMENTARY PUBLICATIONS.

Board of Agriculture.—Grants for Agricultural Education and Research, 1901–1902. [*Cd.* 1,242.] *Price* 6½*d.*

The amount of the grants distributed by the Board to agricultural educational institutions in 1901–1902 in England and Wales was £7,950, while a further sum of £818 was paid in grants to agricultural associations in aid of special experimental work. The aggregate of the grants was thus £8,768, as compared with £8,344 in the previous year.

County Councils appear to be evincing an increasing desire to avail themselves of the assistance of the Board, in its advisory capacity, in the development of their educational schemes, so far as these bear upon agriculture or rural science. During the year under review the Board's Inspector, besides visiting those counties which have for several years placed their schemes of agricultural education under the regular inspection of the Board, made himself personally acquainted with the educational conditions of nearly every county in England.

There is, it is stated, but little change to note in the form of agricultural education in the year 1901–1902. A considerable amount of attention continues to be given to vacation classes for country schoolmasters, though, on the whole, this work is rather fitful in character. A somewhat prominent feature of the work of the various collegiate centres, and of the counties grouped round them, is the expansion of systematic horticultural instruction. In the counties of Cumberland and Northumberland the Instructor in Horticulture of the Durham College of Science has, during the past year, given 77 lectures and public demonstrations to excellent audiences, besides paying many private visits to gardens, regarding the management of which advice was desired. In these counties, also, fruit stations have now been established and promise to be highly successful. The past year has also seen the completion of additions to the buildings at the

Yorkshire Farm at Garforth and at the South-Eastern Agricultural College at Wye, and it may be noted that the latter institution has now been formally affiliated with the University of London.

Part II. of the Appendix to the Report contains a series of accounts of the results of the principal experiments conducted by institutions aided by the Board. Among the subjects of these experiments were the application of various manures to grass, roots, potatoes, and hops; the feeding of sheep and bullocks; the breeding of sheep; the seeding of oats and barley; the rotation of crops; experiments with barley; spraying of charlock; and experiments on ripening and churning of cream.

Part III. of the Appendix contains a statement showing that the total amount expended on agricultural education by English and Welsh County Councils in 1900–1901 was about £86,000, or about £7,000 more than in the previous year.

Memoirs of the Geological Survey: Summary of Progress for 1901. *Price* 1*s.*

This work contains an account of the field work of the Geological Survey in the United Kingdom and of the chemical, petrological and palæontological work in connection therewith. Progress has been made in Cornwall and Devon in sub-dividing the great killas-formation, and even the granite of the Land's End area has proved susceptible of division. In the South Wales area the detailed examination of the coalfield has proceeded as far west as Swansea, and some new inliers of Silurian rocks have been detected in Gower. The resurvey of the Midland coalfields has been continued. Analyses of South Wales coals have been commenced, and some notes on weathering of magnesian limestone have been published. In Scotland, further particulars have been obtained with regard to the highland schists and the

various granite masses. Cretaceous rocks have, for the first time, been noticed in Soay Sound and Scalpay. In Ireland the drifts have been surveyed in the Dublin area.

Report of the Committee of Council on Education in Scotland 1901–2. [*Cd.* 1,109.] *Price* 3*s.* 8*d.*

The Report states that the movement for the establishment of an organisation for agricultural teaching and research in the South-East of Scotland has resulted in the establishment of the Edinburgh and East of Scotland College of Agriculture on lines similar to the institution already existing in the West of Scotland.

The attitude of the Committee towards such movements has been that the support given to each institution from Imperial and national funds must be to a large extent dependent on the appreciation of its work in the various localities concerned, as evidenced by continued local support. The most effective way of securing such support, as well as of ensuring that the work of each institution shall take the direction most likely to be of benefit to the locality, is, the Committee think, to entrust its executive management to a body of governors thoroughly representative of the most enlightened opinion on agricultural subjects among both farmers and landowners; and there are now three such organisations affecting wide districts of Scotland, and affording aid to the agriculture of the district in the form best suited to it.

While the Committee do not think it feasible or desirable to make practical instruction in agriculture part of the curriculum of rural schools in general, they think it possible to give to the studies of the more advanced pupils in many of these schools such a direction as shall foster their interest in rural life, and give them some insight into the scientific principles which underlie the practice of agriculture. When it is desired that opportunity should be afforded to teachers in suitable localities

to qualify themselves more fully to give instruction of this nature, the Committee recommend that advantage should be taken of the provisions of Article 91 (*d*) of the Code, and they are of opinion that such classes for the instruction of teachers in matters appertaining to agriculture should as a rule be held at the central agricultural institutions, and should be under the general direction of the managers thereof, but that the funds for the maintenance of such classes should be provided in the manner specified in Article 91 (*d*) and should not be a charge upon the special agricultural grant to those institutions.

The Department's grant of £2,000 for agricultural education has, since 1900, been augmented by a further sum of £2,000 a year under Section 2, Sub-section 4, of the Local Taxation Account (Scotland) Act, 1898. The sum available for distribution in the year 1901–2, including a balance of £947 8s. 8d. from the preceding year, was £4,947 8s. 8d., and the following table shows the sums actually distributed to the various institutions in 1901–2 as compared with the preceding year :—

Institution, &c.	Sums paid.	
	1900-1901	1901-1902.
	£ s. d.	£ s. d.
Aberdeen University (Agricultural Department)...	500 0 0	500 0 0
Edinburgh School of Rural Economy	1,000 0 0	——
Edinburgh East of Scotland College of Agriculture	——	1,780 0 0
West of Scotland Agricultural College	2,000 0 0	2,350 0 0
Expenses of Inspection, &c.	74 14 2	61 11 2
Totals	£3,574 14 2	£4,691 11 2

The Committee state that the present rate of grants to these institutions cannot be maintained within the sum at present at their disposal for the purpose, and that it may be necessary to make a proportionate reduction in the grants allowed.

Technical Committees (England and Wales). [*H.C.* 369.] *Price 2d.*

This return shows the number and composition of the technical committees in counties and county boroughs in England and

Wales established under the Technical Instruction Acts, and the populations for which they act. Of the 129 counties and county boroughs in England and Wales, 67 have technical committees which consist partly of outside members, and 59 have committees consisting solely of councillors, while in three cases no committee has been appointed. The return shows in the case of each committee the number of members who are councillors and the number of outside members, if any, the latter being classified under categories indicating the ground of selection or the interest represented. The members of committee who are councillors have not been so classified, but they fall within one or more of the categories specified.

The Geology of Eastern Fife.

Among the memoirs recently published for various districts by the Geological Survey is one dealing with the Geology of Eastern Fife, by Sir Archibald Geikie, D.C.L., F.R.S. with an Appendix of Fossils by Mr. B. N. Peach, F.R.S., price 8s. The volume is accompanied by a coloured map of Eastern Fife, showing the geology. The distribution, history of investigation, and development of the old red sandstone are given, and a detailed description is furnished of the development of the calciferous sandstone series of the district, of the edge coals, and of the true coal measures near Leven. The intrusive igneous rocks and volcanic necks of Eastern Fife are described in detail. The volume also deals with the glacial deposits and the latest geological changes, while one section is devoted to economic minerals.

LIVE WEIGHT PRICES OF CATTLE.

The returns received from the twenty-one places in Great Britain scheduled under the Markets and Fairs (Weighing of Cattle) Act, 1891, showed a material increase in the number of cattle, sheep, and pigs entering the markets during the third quarter of 1902 as compared with the corresponding period of 1901. This was most noticeable in the case of cattle, of which 293,000 head were offered for sale in these markets, as against 224,500 head in 1901.

Animals.	3rd Quarter, 1902.	3rd Quarter, 1901.
Cattle:	*No.*	*No.*
Entering markets	293,293	224,506
Weighed	42,140	33,534
Prices returned	33,171	27,948
Prices returned with quality distinguished	27,012	22,771
Sheep:		
Entering markets	1,524,749	1,482,746
Weighed	10,305	9,014
Prices returned with quality distinguished	8,466	7,898
Swine:		
Entering markets	80,323	71,367
Weighed	618	630
Prices returned with quality distinguished	618	630

The number of cattle weighed also reached a higher aggregate than in any corresponding quarter, and represented a higher percentage in England, but a somewhat lower proportion in Scotland of the total recorded. Prices showing the quality of the animals were available for about one in every eleven of the cattle exposed in these markets. The weigh-bridges are only employed to an insignificant extent for sheep and pigs, while, as will be seen from the table on page 416, the number of cattle weighed and priced at several English markets is still very small. Sufficient data for the calculation of an average price

for fat cattle were, however, obtained from the thirteen markets shown in the following table :—

PLACES.	INFERIOR or Third Quality.			GOOD or Second Quality.			PRIME or First Quality.		
	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.
		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.
Carlisle ...	297	3 5¾	27 10	396	3 10¾	30 10	1,195	4 4¾	35 2
Leicester ...	8	4 0½	32 4	48	4 5	35 4	382	4 6¼	36 2
Leeds... ...	—	—	—	336	4 5¼	35 6	546	4 9	38 0
Liverpool ...	201	3 7	28 8	681	4 0¾	32 6	2,631	4 8¾	37 10
London ...	—	—	—	317	4 7¼	36 10	983	5 1	40 8
Newcastle ...	—	—	—	77	4 5	35 4	190	5 1¼	40 10
Shrewsbury..	100	3 9	30 0	102	4 3½	34 4	93	4 8½	37 8
Aberdeen ...	1,161	3 4¾	27 2	1,413	4 7¾	37 2	1,916	5 1½	41 0
Dundee ...	331	3 4	26 8	949	4 7¼	36 10	683	5 1¼	40 10
Edinburgh...	—	—	—	2,973	4 8¾	37 10	156	5 2½	41 8
Falkirk ...	248	3 10½	31 0	334	4 4¾	35 2	347	4 10	38 8
Glasgow ...	415	4 7½	37 0	457	4 9¾	38 6	1,546	4 11¼	39 6
Perth	69	3 11	31 4	482	4 5	35 4	538	4 11¾	39 10

These figures show a decline in the average price of fat cattle compared with the previous quarter, those of prime quality realising only 39s. per cwt., as against 39s. 10d., while second quality fell from 35s. 10d. to 35s. 6d. per cwt. The general course of prices in Great Britain is, however, more succinctly shown in the table on the next page, which is compiled from the returns received monthly from the thirteen markets above mentioned.

It will be seen that in June last the price of fat cattle touched a maximum of 40s. 4d. per cwt. for second quality, and 42s. 8d. for first quality, but these rates were not maintained in the following month, when there was a fall of from 8d. to 1s. 4d. per cwt. In August, September, and October the decline became still more apparent, and prices for second quality animals in the last-named month were only 34s. 4d., while prime quality

beasts averaged 36s. 6d. per cwt., prices which were in both cases the same as those reported in December, 1901. It appears from these figures that the value of fat cattle in Great Britain fell generally by about 6s. per cwt. between June and October. It

MONTHS.	Good, or Second Quality.				Prime, or First Quality.			
	1902.		1901.		1902.		1901.	
	per cwt. s.	d.	per cwt. s.	d.	per cwt. s.	d.	per cwt. s.	d.
January...	34	6	34	8	36	2	36	2
February	34	6	34	6	36	4	35	10
March	34	6	34	2	36	4	36	0
April	35	10	34	2	37	8	36	0
May	37	4	34	2	39	8	36	0
June	40	4	34	8	42	8	36	4
July	39	8	34	8	41	4	36	4
August	36	6	34	10	38	4	36	0
September	34	10	33	10	37	2	35	6
October	34	4	33	6	36	6	35	2

may be observed that corroborative evidence of this fact is furnished by the tables relating to meat prices on p. 417 of this *Journal*, which show that whereas in June and July the prices of English beef at the London Central Market were quoted at from 4s. 7d. to 4s. 10d. per stone of 8 lb., the corresponding quotations in October ranged from 3s. 10d. to 4s. 2d.

At five markets store cattle were reported to have been weighed, and prices were furnished in respect of 4,112 head, the majority of which were returned from Shrewsbury. At this market the average price of second quality store cattle in the third quarter was 34s. 6d. per cwt., or 1s. less than in the preceding three months, while first quality animals averaged 37s. 4d. as against 39s. 6d. per cwt. in the second quarter of the current year.

The table giving the usual particulars for the quarter is appended :—

CATTLE, SHEEP, AND SWINE, *entering and weighed at the Markets and Marts of the undermentioned Places, in the* THIRD QUARTER *of* **1902,** *as returned under the Markets and Fairs (Weighing of Cattle) Act,* 1891 (54 *and* 55 *Vict. c.* 70).

PLACES.	Cattle.			Sheep.			Swine.		
	Total Number entering the Markets or Marts.	Number Weighed.	Number Weigh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.
ENGLAND.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Ashford	2,980	17	—	36,629	—	—	4,712	—	—
Birmingham... ...	4,620	—	—	31,232	—	—	38,663	—	—
Bristol	20,971	—	—	37,628	—	—	—	—	—
Carlisle	10,461	1,888	1,888	122,931	—	—	2,899	—	—
Leicester	16,880	628	567	24,519	47	47	1,582	—	—
Leeds	8,126	882	882	28,870	—	—	14	—	—
Lincoln	2,097	—	—	15,310	—	—	3,066	9	9
Liverpool	18,638	3,513	3,513	214,725	1,819	1,819	—	—	—
London	19,155	4,131	1,300	125,450	1,824	58	255	—	—
Newcastle-upon-Tyne	24,181	267	267	119,318	—	—	6,387	529	529
Norwich	22,034	33	33	58,602	—	—	5,331	6	6
Salford	25,900	990	—	206,267	—	—	537	—	—
Shrewsbury	13,512	5,990	3,873	35,771	—	—	5,934	—	—
Wakefield	17,520	2,116	266	45,167	—	—	—	—	—
York	23,651	—	—	47,391	—	—	755	—	—
SCOTLAND.									
Aberdeen	10,361	4,502	4,502	93,745	5,766	5,766	3,813	—	—
Dundee	4,015	1,972	1,972	7,523	493	493	729	—	—
Edinburgh	16,594	7,954	*3,513	61,845	—	—	1,587	—	—
Falkirk	2,640	929	929	3,737	—	—	22	—	—
Glasgow	15,613	3,521	2,418	128,035	73	—	1,114	—	—
Perth...	13,344	2,807	*1,089	80,054	283	283	2,923	74	74
TOTAL for ENGLAND	230,726	20,455	12,589	1,149,810	3,690	1,924	70,135	544	544
TOTAL for SCOTLAND	62,567	21,685	*14,423	374,939	6,615	6,542	10,188	74	74
Total	293,293	42,140	*27,012	1,524,749	10,305	8,466	80,323	618	618

* Prices for 4,441 cattle in addition to the above were quoted from Edinburgh and for 1,718 cattle from Perth, but without distinguishing the quality.

PRICES OF MEAT, CORN, AND DAIRY PRODUCE.

AVERAGE PRICES of DEAD MEAT, per 8 lb., at the LONDON CENTRAL MEAT MARKET, during the Third Quarter of 1902, and during the Months of September, October, and November, 1902.

(Compiled from the prices quoted weekly in the "Meat Trades' Journal.")

DESCRIPTION.	3RD QUARTER.	SEPTEMBER.	OCTOBER.	NOVEMBER.
BEEF :—	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Scotch, short sides	5 0 to 5 4	4 9 to 5 1	4 8 to 5 1	4 9 to 5 1
,, long sides	4 7 ,, 4 9	4 4 ,, 4 6	4 2 ,, 4 6	4 3 ,, 4 5
English...	4 4 ,, 4 7	4 1 ,, 4 4	3 10 ,, 4 2	3 10 ,, 4 1
Cows and Bulls	2 3 ,, 3 7	2 2 ,, 3 6	2 3 ,, 3 4	2 1 ,, 3 4
American, Birkenhead killed...	4 1 ,, 4 4	3 11 ,, 4 3	3 7 ,, 3 11	3 7 ,, 3 11
,, Deptford killed ...	4 2 ,, 4 6	4 0 ,, 4 4	3 9 ,, 4 1	3 9 ,, 4 1
Canadian Ranchers	3 5 ,, 3 11	3 6 ,, 3 11	2 11 ,, 3 4	3 2 ,, 3 6
American, Refrig. hind-quarters	4 7 ,, 4 11	4 9 ,, 4 11	4 6 ,, 4 9	4 4 ,, 4 8
,, ,, fore-quarters	3 1 ,, 3 4	3 2 ,, 3 4	2 11 ,, 3 1	3 0 ,, 3 3
Australian, Frozen, hind-quarters	3 4 ,, 3 5	2 9 ,, —	2 9 ,, 2 10	2 9 ,, 2 10
,, ,, fore-quarters	2 7 ,, 2 8	2 6 ,, —	2 6 ,, 2 7	2 5 ,, 2 6
New Zealand, ,, hind-quarters	3 5 ,, 3 6	3 1 ,, 3 2	3 3 ,, 3 4	3 2 ,, 3 3
,, ,, fore-quarters	2 8 ,, —	2 8 ,, —	2 8 ,, 2 9	2 8 ,, 2 9
River Plate, ,, hind-quarters	3 3 ,, 3 4	2 10 ,, 2 11	3 0 ,, —	3 0 ,, —
,, ,, fore-quarters	2 7 ,, —	2 7 ,, —	2 8 ,, —	2 8 ,, —
MUTTON :—				
Scotch	4 8 ,, 5 1	4 6 ,, 4 10	4 5 ,, 4 8	4 5 ,, 4 9
English	4 5 ,, 4 10	4 2 ,, 4 6	4 0 ,, 4 5	4 1 ,, 4 6
Ewes	3 3 ,, 3 8	3 2 ,, 3 7	2 11 ,, 3 4	3 0 ,, 3 5
Continental	4 1 ,, 4 6	3 11 ,, 4 5	3 7 ,, 4 0	3 10 ,, 4 2
New Zealand, Frozen... ...	2 2 ,, 2 9	2 1 ,, 2 8	2 7 ,, 3 1	3 0 ,, 3 4
Australian, Frozen	2 3 ,, —	—	—	2 11 ,, —
River Plate, Frozen	2 3 ,, 2 4	2 3 ,, 2 4	2 7 ,, 2 8	3 0 ,, —
LAMB :—				
English	4 7 ,, 5 5	4 3 ,, 5 0	4 0 ,, 4 8	—
New Zealand, Frozen... ...	2 11 ,, 3 2	3 0 ,, 3 4	3 8 ,, 3 9	3 8 ,, 3 10
VEAL :—				
Best	4 3 ,, 4 8	4 4 ,, 4 9	4 4 ,, 4 9	4 9 ,, 5 1
Secondary and middling ...	3 7 ,, 4 2	3 7 ,, 4 2	3 6 ,, 4 1	3 9 ,, 4 4
PORK :—				
English, best	4 3 ,, 4 7	4 5 ,, 4 9	4 6 ,, 4 11	4 6 ,, 4 10
,, seconds and thirds ...	3 7 ,, 3 11	3 8 ,, 4 0	3 7 ,, 4 0	3 7 ,, 3 11

AVERAGE WHOLESALE PRICES of CATTLE and SHEEP, per 8 lb., sinking the offal, at the METROPOLITAN CATTLE MARKET, during the under-mentioned Quarters of 1901 and 1902.

PERIOD.	CATTLE.			SHEEP.		
	Inferior.	Second.	First.	Inferior.	Second.	First.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
3rd Quarter, 1901	2 4	4 0	4 7	3 2	4 9	5 7
4th Quarter, ,,	2 5	4 0	4 9	3 2	4 10	5 7
1st Quarter, 1902	2 7	3 11	4 8	3 6	4 10	5 6
2nd Quarter, ,,	3 3	4 6	5 1	3 10	5 2	6 0
3rd Quarter, ,,	3 1	4 7	5 1	3 8	5 0	5 9

AVERAGE WHOLESALE PRICES of BEEF and MUTTON, per 8 lb., by the Carcase, at LIVERPOOL and GLASGOW, during the under-mentioned Quarters of 1901 and 1902.

PERIOD.	LIVERPOOL.*		GLASGOW.†	
	BEEF.	MUTTON.	BEEF.	MUTTON.
	s. d. s. d.	*s. d. s. d.*	*s. d. s. d.*	*s. d. s. d.*
3rd Quarter, 1901	3 0 to 3 11	3 8 to 5 0	3 0 to 3 10	3 8 to 4 8
4th Quarter, ,,	2 4 ,, 4 0	3 4 ,, 4 10	3 0 ,, 3 10	3 0 ,, 4 4
1st Quarter, 1902	2 6 ,, 4 0	3 4 ,, 5 4	4 4 ,, 4 10	5 0 ,, 5 10
2nd Quarter, ,,	3 4 ,, 4 8	3 6 ,, 5 6	4 4 ,, 5 8	4 4 ,, 6 8
3rd Quarter, ,,	2 8 ,, 4 8	3 4 ,, 5 0	4 2 ,, 5 6	4 0 ,, 5 8

* Compiled from information furnished by the Medical Officer of Health, Liverpool. The prices quoted are for Carcases of Animals *slaughtered at the Liverpool Abattoir*, and do not apply to Imported Meat.

† Compiled from information furnished by the Principal of the Veterinary College, Glasgow.

BERLIN MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Dead Weight) in the BERLIN CATTLE MARKET in the under-mentioned Months of 1902.

MONTHS.	OXEN.		SHEEP.		SWINE.	
	Per Cwt.		Per Cwt.		Per Cwt.	
1902.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
July	61	1	65	10	60	4
August	65	1	67	9	64	5
September	65	10	68	9	63	3
October	65	11	67	5	62	6

NOTE.—The above prices are compiled from the Wholesale Prices quoted in the *Monatliche Nachweise über den auswärtigen Handel des deutschen Zollgebiets.* The prices for swine are live weight prices with 20 per cent. tare.

PARIS MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Medium Quality, Dead Weight), per cwt., in the PARIS CATTLE MARKET in the under-mentioned Months of 1902.

MONTHS.	OXEN.		CALVES.		SHEEP.		PIGS.	
	Per Cwt.		Per Cwt.		Per Cwt.		Per Cwt.	
1902.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
September	53	9	59	6	72	11	59	6
October	52	5	68	3	72	3	57	5
November	52	11	70	3	72	3	54	4

NOTE.—The above prices have been compiled from the weekly returns published in the *Journal d'Agriculture Pratique.*

CHICAGO.

AVERAGE PRICES of CATTLE at CHICAGO per cwt. (Live Weight) in the under-mentioned Months of 1902.

MONTH.	Medium to Good Steers.					Good to Choice Steers.					Choice to Extra Prime Steers.				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.
September ...	25	5	to	30	7	33	6	to	38	2	38	2	to	41	6
October	25	9	,,	30	10	32	1	,,	36	6	37	4	,,	40	7
November ...	22	2	,,	26	3	26	6	,,	30	11	32	1	,,	34	8

Compiled from the Live Stock Reports issued by Messrs. Clay, Robinson and Co., of the Union Stock Yards, Chicago, Illinois.

AVERAGE VALUES, per cwt., of various Kinds of DEAD MEAT Imported into the United Kingdom from FOREIGN COUNTRIES and BRITISH POSSESSIONS in the under-mentioned Quarters of 1901 and 1902.

(Computed from the Trade and Navigation Accounts.)

PERIOD.	BEEF. Fresh.		BEEF. Salted.		MUTTON. Fresh.		PORK. Fresh.		PORK. Salted.		BACON.		HAMS.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
3rd Quarter, 1901 ...	39	4	26	3	37	2	43	5	24	4	46	9	49	11
4th Quarter, ,, ...	38	9	27	1	34	11	43	4	27	7	49	3	50	2
1st Quarter, 1902 ...	40	3	28	8	35	1	43	3	31	6	47	8	48	3
2nd Quarter, ,, ...	43	6	31	4	38	1	44	11	28	10	51	3	50	0
3rd Quarter, ,, ...	43	10	33	2	38	5	44	2	28	4	55	8	54	9

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels,* computed from the Weekly Averages of Corn Returns from the Returning Markets of ENGLAND AND WALES, pursuant to the Corn Returns Act, 1882, together with the QUANTITIES returned as sold at such Markets, in the under-noted periods of the Years 1902, 1901, and 1900.

QUARTER ENDED	PRICES.			QUANTITIES.		
	1902.	1901.	1900.	1902.	1901.	1900.
Wheat.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	27 3	26 3	25 11	826,065	744,018	868,378
Midsummer ...	29 10	27 1	25 9	444,639	547,737	854,497
Michaelmas ...	30 2	26 11	28 7	222,495	535,109	511,347
Christmas ...	—	26 7	27 4	—	778,686	689,261
Barley.						
	s. d.	*s. d.*	*s. d.*	*Quarters*	*Quarters.*	*Quarters.*
Lady Day ...	26 8	25 3	25 1	669,250	844,616	888,949
Midsummer ...	25 6	24 9	24 3	40,875	53,408	93,157
Michaelmas ...	25 1	24 0	24 5	32,318	236,164	143,552
Christmas ...	—	26 8	25 11	—	2,235,441	2,065,135
Oats.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters*
Lady Day ...	20 3	17 6	16 7	239,048	236,316	246,949
Midsummer ...	22 1	19 3	18 2	88,274	81,172	110,163
Michaelmas ...	21 3	18 7	18 7	101,130	131,023	116,880
Christmas ...	—	18 4	17 0	—	265,703	237,791

* Section 8 of the Corn Returns Act, 1882, provides that where returns of purchases of British Corn are made to the local inspector of Corn Returns in any other measure than the imperial bushel or by weight or by a weighed measure, that officer shall convert such returns into the imperial bushel, and in the case of weight or weighed measure the conversion is to be made at the rate of 60 imperial pounds for every bushel of wheat, 50 imperial pounds for every bushel of barley, and 39 imperial pounds for every bushel of oats.

CORN PRICES:—HARVEST YEAR.

AVERAGE PRICES of **British Corn** per Quarter of 8 imperial bushels, computed from the Weekly Averages of Corn Returns, together with the QUANTITIES returned as sold at the Returning Markets during each of the Harvest Years ending 31st August, 1890 to 1902.

HARVEST YEARS.	PRICES.			QUANTITIES.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
1889-90 ...	31 2	28 10	18 6	3,289,806	3,281,141	558,053
1890 91 ...	35 5	28 0	19 1	3,496,788	3,659 382	602,887
1891-92 ...	33 4	27 2	20 8	3,267,038	3,260,327	488,830
1892-93 ...	26 8	24 10	18 9	2,676,227	3,383,094	547,412
1893-94 ...	25 5	26 5	18 4	2,087,062	2,876,977	542,425
1894-95 ...	21 5	21 5	14 8	2,180,959	3,136,415	693,121
1895-96 ...	24 10	22 4	14 1	1,640,943	3,366,364	672,547
1896-97 ...	28 8	23 2	16 9	2.597.268	3,200.612	551,912
1897-98 ...	36 2	26 11	18 3	2,534,224	3.339,842	599,666
1898-99 ...	26 0	26 1	17 3	3.498,515	3,629,760	777,676
1899-00 ...	26 4	25 2	17 4	3 255,654	3,355,241	722,859
1900-01 ...	27 1	25 0	18 1	2,463.341	3.109,149	684,956
1901-02 ...	28 4	25 11	20 4	2,451,275	3,176 599	698,840

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1902, and in the corresponding Weeks in 1901 and 1900.

Weeks ended (*in* 1902).	Wheat.			Barley.			Oats.		
	1902.	1901.	1900.	1902.	1901.	1900.	1902.	1901.	1900.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 4 ...	27 7	26 5	25 9	26 7	25 4	25 7	19 10	17 2	16 2
,, 11 ...	27 8	26 7	25 11	26 7	25 6	25 5	20 0	17 3	16 3
,, 18 ...	27 8	26 11	26 0	26 11	25 9	25 8	20 0	17 3	16 2
,, 25 ...	27 7	26 10	25 10	26 7	25 6	25 9	20 3	17 6	16 4
Feb. 1 ...	27 4	26 7	25 8	26 7	25 7	25 4	20 2	17 8	16 6
,, 8 ...	27 2	26 8	25 10	26 9	25 7	25 3	20 3	17 7	16 5
,, 15 ...	26 11	26 4	26 1	27 5	25 4	24 11	20 3	17 7	16 8
,, 22 ...	27 1	26 1	26 3	26 11	25 0	25 1	20 4	17 7	16 9
Mar. 1 ...	27 1	25 11	26 4	26 8	25 0	24 6	20 5	17 9	16 10
,, 8 ...	27 0	25 9	25 11	26 8	25 4	24 8	20 5	17 7	16 11
,, 15 ...	27 1	25 9	25 10	26 6	25 1	24 6	20 6	17 7	16 11
,, 22 ...	27 1	25 8	25 11	26 4	24 11	25 0	20 6	17 9	17 1
,, 29 ...	27 2	26 0	25 10	27 2	24 9	24 11	20 7	18 0	17 2
Apl. 5 ...	27 3	26 3	25 10	26 5	25 3	24 10	20 6	18 0	17 2
,, 12 ...	27 5	26 5	25 11	26 7	26 0	24 5	21 0	18 1	17 8
,, 19 ...	27 7	26 8	26 0	27 1	25 7	24 9	21 1	18 8	17 3
,, 26 ...	28 9	26 8	26 0	26 5	25 8	25 2	21 6	18 8	17 11
May 3 ...	29 9	26 9	25 11	27 5	26 4	25 3	21 10	19 1	18 0
,, 10 ...	30 9	27 3	25 11	26 10	26 2	24 10	22 6	19 1	17 11
,, 17 ...	31 1	27 7	25 7	25 3	24 2	24 5	22 5	19 4	18 5
,, 24 ...	31 6	27 7	25 5	25 4	24 1	23 11	22 6	19 8	18 2
,, 31 ...	31 6	27 7	25 5	25 1	23 8	24 4	22 10	19 9	18 6
June 7 ...	31 3	27 6	25 3	24 3	22 9	23 8	22 11	20 1	18 8
,, 14 ...	30 11	27 8	25 6	23 8	24 0	23 8	22 8	19 7	18 11
,, 21 ...	30 6	27 6	25 9	23 5	23 2	23 5	23 0	20 3	18 11
,, 28 ...	30 5	27 6	26 11	24 3	25 4	23 4	22 9	20 0	19 3
July 5 ...	30 8	27 8	27 10	25 5	21 9	22 10	22 5	19 10	19 5
,, 12 ...	30 10	27 2	28 7	24 8	23 10	23 2	22 10	19 9	19 1
,, 19 ...	30 11	27 3	29 0	23 8	23 4	23 8	22 10	19 11	19 3
,, 26 ...	31 5	27 3	29 3	25 0	22 1	24 4	22 8	19 4	19 9
Aug. 2 ...	31 8	27 6	28 10	25 0	23 1	23 10	22 10	20 0	19 4
,, 9 ...	31 7	27 7	28 7	24 11	22 1	23 7	22 11	19 4	19 8
,, 16 ...	31 7	27 4	28 10	24 9	27 2	23 3	22 2	18 9	19 11
,, 23 ...	31 5	27 3	28 10	22 10	23 7	24 10	21 11	18 1	18 8
,, 30 ...	31 7	27 0	28 8	26 2	24 3	25 2	21 0	17 10	18 1
Sept. 6 ...	29 9	26 5	28 7	24 6	25 1	25 8	19 10	17 6	17 10
,, 13 ...	27 10	26 2	28 4	27 5	24 11	25 4	19 2	17 4	17 1
,, 20 ...	27 1	26 0	28 4	26 4	25 5	26 0	18 4	17 4	17 1
,, 27 ...	26 6	25 10	28 9	26 4	25 10	26 1	18 0	17 2	17 2
Oct. 4 ...	25 10	25 8	28 9	25 11	26 3	26 2	17 5	17 7	16 10
,, 11 ...	25 5	25 9	28 9	26 2	26 5	26 2	17 2	17 6	17 1
,, 18 ...	25 1	25 10	28 4	26 1	26 8	26 5	17 0	17 8	16 11
,, 25 ...	24 11	25 11	27 11	26 4	26 10	26 3	17 0	17 5	16 11
Nov. 1 ...	25 0	26 2	27 5	26 7	26 10	26 3	17 3	17 7	16 11
,, 8 ...	25 1	26 6	27 3	26 3	27 0	25 11	17 2	17 8	16 10
,, 15 ...	25 0	26 9	27 1	25 11	26 9	25 8	17 3	18 3	17 1
,, 22 ...	24 11	27 1	27 2	25 6	26 10	25 10	17 2	18 7	17 0
,, 29 ...	25 0	27 1	27 0	24 11	26 9	25 9	17 0	18 9	17 2
Dec. 6 ...	25 1	27 1	26 10	24 4	26 7	25 11	17 0	19 0	17 4
,, 13 ...	25 0	27 2	26 9	24 3	26 8	25 7	16 10	19 3	17 1
,, 20 ...		27 7	26 7		26 8	25 7		19 8	17 2
,, 27 ...		27 7	26 4		26 8	25 10		19 10	17 2

AVERAGE PRICES of WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER in BELGIUM in the under-mentioned Months of 1902.

Month.	Wheat.		Barley.		Oats.	
1902.	s.	d.	s.	d.	s.	d.
August	30	1	22	4	23	9
September	27	2	22	2	18	11
October	27	7	22	3	18	4

The above prices have been compiled from the official monthly averages published in the *Moniteur Belge*.

AVERAGE PRICES of WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER in FRANCE, and ENGLAND and WALES in the under-mentioned Months of 1902.

MONTH.	FRANCE.		ENGLAND.	
WHEAT.				
1902.	Per Qr. s.	d.	Per Qr. s.	d.
September	35	10	27	9
October	35	10	25	3
November	36	2	25	0
BARLEY.				
1902.	Per Qr. s.	d.	Per Qr. s.	d.
September	22	9	26	1
October	22	6	26	1
November	22	8	25	10
OATS.				
1902.	Per Qr. s.	d.	Per Qr. s.	d.
September	19	8	18	10
October	18	11	17	1
November	18	11	17	2

Note.—The prices of French grain have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*. The prices of British grain are official averages based on the weekly returns furnished under the Corn Returns Act, 1882.

AVERAGE PRICES of WHEAT, BARLEY, and OATS per IMPERIAL QUARTER at LONDON, PARIS, and BERLIN, in the under-mentioned Months of 1902.

Month.	London.		Paris.		Berlin.	
WHEAT.						
	Per Qr.		Per Qr.		Per Qr.	
1902	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
July	31	10	41	4	36	6
August	32	0	38	11	34	6
September	28	7	35	11	33	10
October	27	0	36	1	33	1
November	25	10	36	9	—	
BARLEY.						
	Per Qr.		Per Qr.		Per Qr.	
1902	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
July	25	0	24	0	22	10*
August	25	1	23	10	22	10*
September	26	3	22	10	23	1*
October	27	5	22	7	24	1*
November	26	0	23	0	—	
OATS.						
	Per Qr.		Per Qr.		Per Qr.	
1902	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
July	23	3	24	8	23	9
August	21	6	22	3	19	11
September	19	10	19	7	19	2
October	17	11	19	3	19	3
November	18	2	19	2	—	

Note.—The London quotations represent the price of British corn as returned under the Corn Returns Act, 1882 ; the prices of grain in Paris have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique* ; the quotations for Berlin are the average prices published monthly in the *Monatliche Nachweise über den auswärtigen Handel des deutschen Zollgebiets.*

* Prices at Breslau ; no quotations for Berlin.

PRICES OF WOOL.

AVERAGE PRICES of ENGLISH WOOL, per pack of 240 lbs. in the under-mentioned Months of 1902.

(*Compiled from the "Economist."*)

DESCRIPTION.	September.	October.	November.
	£ s. d. £ s. d.	£ s. d. £ s. d.	£ s. d. £ s. d.
South Down ...	7 0 0 to 9 10 0	7 0 0 to 9 10 0	7 8 0 to 9 18 0
Half-breds ...	5 10 0 ,, 7 0 0	5 10 0 ,, 7 0 0	5 12 0 ,, 7 2 0
Leicester ...	5 0 0 ,, 5 10 0	5 0 0 ,, 5 10 0	5 2 0 ,, 5 12 0
Kent Fleeces ...	5 10 0 ,, 6 0 0	5 10 0 ,, 6 0 0	5 12 0 ,, 6 1 0

AVERAGE WHOLESALE PRICES of BUTTER, MARGARINE, and CHEESE in the under-mentioned Months of 1902.

(*Compiled from the "Grocer."*)

DESCRIPTION.	SEPTEMBER.				OCTOBER.				NOVEMBER.			
	Per Cwt.				Per Cwt.				Per Cwt.			
BUTTER:	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Cork, 1sts	92	6	—		96	6	—		94	0	—	
,, 2nds	86	0	—		89	6	—		88	6	—	
,, 3rds	81	6	—		84	0	—		82	6	—	
,, 4ths	71	6	—		75	6	—		77	6	—	
Irish Creameries ...	100	6	to 108	0	103	0	to 109	0	100	0	to 107	6
,, Factories ...	87	6	,, 94	6	85	0	,, 96	0	87	0	,, 97	6
Dutch, Friesland ...	93	6	,, 96	0	97	6	,, 100	0	102	0	,, 104	0
,, Creameries ...	99	0	,, 102	6	102	0	,, 105	0	105	6	,, 108	6
,, Rolls, boxes ...	11	8	,, 12	2	11	10	,, 12	9	12	0	,, 12	8
French, extra mild ...	100	6	,, 103	0	98	6	,, 102	6	100	6	,, 104	0
,, best ordinary ...	88	6	,, 92	6	89	0	,, 95	0	92	6	,, 97	0
,, 2nds and inferior ...	80	6	,, 86	6	77	6	,, 85	6	71	6	,, 87	0
,, Fresh, Paris baskets	98	6	,, 101	0	98	0	,, 101	6	101	6	,, 104	6
,, Rolls, per doz. ...	9	10	,, 13	4	9	9	,, 13	6	10	2	,, 13	8
Italian Rolls, per doz.	10	0	,, 12	10	10	1	,, 12	9	10	2	,, 12	7
Danish and Swedish ...	114	0	,, 116	0	116	6	,, 119	0	115	0	,, 118	0
Finnish	88	0	,, 96	0	—				—			
Russian and Siberian ...	80	6	,, 93	0	81	0	,, 95	0	81	0	,, 95	0
American	76	6	,, 85	6	76	0	,, 84	0	70	0	,, 84	0
Argentine	—				108	0	,, 110	0	108	0	,, 110	6
Colonial, fine	—				—				111	6	,, 115	0
,, good and inferior	—				—				—			
Canadian Creameries ...	95	6	,, 104	0	93	6	,, 105	6	91	6	,, 104	6
,, Dairies	80	0	,, 88	6	80	0	,, 87	6	81	0	,, 87	6
Canadian and States ...	90	0	,, 100	0	—				—			
MARGARINE	40	0	,, 63	0	40	0	,, 64	0	41	0	,, 65	0
CHEESE, ENGLISH:												
Cheddar, new	56	0	,, 70	0	58	0	,, 74	0	56	0	,, 74	0
,, loaf	66	0	,, 68	0	66	0	,, 69	0	66	0	,, 68	0
Wiltshire ,, ...	68	0	,, 70	0	70	0	,, 72	0	72	0	,, 74	0
Double Gloucester ...	57	6	,, 60	0	62	6	,, 64	6	65	0	,, 68	0
Derby, Factory ...	56	0	,, 58	0	60	0	,, 60	6	60	0	,, 62	0

WEEKLY PRICES (WHOLESALE) of VEGETABLES and FRUIT at COVENT GARDEN MARKET in each week of November, 1902.

(Compiled from the "Gardeners' Chronicle.")

Description.	Week ending November 1st.		November 8th.		November 15th.		November 22nd.		November 29th.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
VEGETABLES—										
Artichokes, Globe, per dozen	2 0 to	3 0	2 0 to	2 6	2 6 to	3 0	2 6 to	3 0	2 6 to	3 0
,, Jerusalem, per sieve	1 6	—	1 6	—	1 6	—	1 6	—	1 6	—
Asparagus, sprue	0 10 ,,	1 0	1 9	—	1 0	—	0 9	—	1 0	—
,, bundle	—	—	—	—	5 0	—	5 0	—	6 0	—
Beans, dwarf, per lb.	0 7 ,,	0 9	0 6	—	0 6	—	0 6	—	0 8 ,,	0 10
,, Madeira, per basket	0 6 ,,	1 0	2 0	—	1 6	—	1 6 ,,	2 0	2 0	—
Beetroots, bushel	2 6 ,,	3 6	1 6	—	1 3 ,,	1 6	1 3 ,,	1 6	1 3 ,,	1 6
Brussels Sprouts, per sieve	1 0 ,,	1 3	1 0 ,,	1 3	1 3 ,,	1 9	0 9 ,,	1 0	0 9 ,,	1 0
Cabbage, per tally	1 6 ,,	3 0	1 6 ,,	2 0	1 6 ,,	2 0	1 6 ,,	2 6	1 6 ,,	2 6
Carrots, bunches, dz.	1 6 ,,	2 0	1 6 ,,	2 0	1 6 ,,	2 0	1 6 ,,	2 0	1 6 ,,	2 0
,, bag (washed)	2 6 ,,	2 9	2 6	—	2 6	—	2 6	—	2 6	—
Cauliflowers, per dz.	0 6 ,,	1 6	0 6 ,,	1 6	0 6 ,,	1 6	0 6 ,,	1 6	1 0 ,,	2 0
Celery, bundles, per dozen	9 0 ,,	10 0	9 0 ,,	10 0	8 0 ,,	10 0	8 0 ,,	10 0	8 0 ,,	10 0
Cress, punnets, per dz.	1 3	—	1 3	—	1 3	—	1 3	—	1 3	—
Cucumbers, per doz.	3 0 ,,	4 0	3 0 ,,	4 0	3 0 ,,	4 6	3 0 ,,	5 0	3 0 ,,	5 0
Endive, per dozen	1 0	—	1 0	—	1 0	—	1 6	—	1 6	—
Garlic, per lb.	0 3	—	0 3	—	0 3	—	0 3	—	0 3	—
Leeks, bunches, doz.	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6
Lettuces, Cos, per dz.	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0	—	—	—	—
,, Cabbage, per dozen	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0
Mint bunches, per dz.	1 0	—	1 0	—	1 0	—	0 4 ,,	0 6	0 4 ,,	0 6
Mushrooms, House, per lb.	1 0 ,,	1 3	1 0 ,,	1 3	1 0	—	1 0 ,,	1 3	1 0	—
Onions, new green, bunches, per doz.	1 6 ,,	2 0	1 6 ,,	2 0	1 6 ,,	2 0	2 0	—	—	—
,, per bag	3 0 ,,	3 6	3 0 ,,	3 6	2 6 ,,	3 6	2 6 ,,	3 6	2 6 ,,	3 6
,, picklers, per sieve	2 0 ,,	3 0	2 0 ,,	3 0	2 0 ,,	3 0	2 0 ,,	3 0	2 0 ,,	3 0
Parsley, bunches, dz.	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6	1 0 ,,	1 6
,, per sieve	0 6 ,,	0 9	0 6 ,,	0 9	0 6 ,,	0 9	0 6 ,,	0 9	0 6 ,,	0 9
Parsnips, per bag	2 6	—	2 0 ,,	2 6	2 0 ,,	2 6	2 0 ,,	2 6	2 0 ,,	2 6
Potatoes, per ton	60 0 ,,	100 0	60 0 ,,	100 0	60 0 ,,	100 0	60 0 ,,	100 0	90 0 ,,	110 0
Radishes, bunches dz.	1 0	—	1 0	—	0 9 ,,	1 0	0 9 ,,	1 0	0 9 ,,	1 0
Salad, small punnets, per dozen	1 3	—	1 3	—	1 3	—	1 3	—	1 3	—
Shallots, per doz.	0 1½	—	0 1½	—	0 1½	—	0 1½	—	0 1½ ,,	0 2
Spinach, Eng., bshl.	1 0 ,,	1 6	1 0 ,,	1 6	0 9 ,,	1 6	0 9 ,,	1 0	0 9 ,,	1 0
Tomatoes, English, per doz. lbs.	4 0 ,,	5 0	4 0 ,,	5 0	4 0 ,,	5 0	4 0 ,,	5 6	4 0 ,,	5 0
,, Channel Islands, per lb.	0 3 ,,	0 4	0 3 ,,	0 4	0 3 ,,	0 4	0 3 ,,	0 4	—	—
Turnips, per dozen	1 6 ,,	2 0	1 6 ,,	2 0	1 6	—	1 6 ,,	2 0	1 6 ,,	2 0
,, bags	2 0 ,,	2 6	2 0 ,,	2 6	1 6 ,,	2 6	1 6 ,,	2 6	1 6 ,,	2 6
Watercress, bunches per dozen	0 3 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6	0 3 ,,	0 6
FRUIT—										
Apples, English, per sieve	2 0 ,,	4 0	2 0 ,,	3 6	2 0 ,,	3 6	2 0 ,,	3 6	2 0 ,,	3 6
,, Blenheims, per bushel	5 0 ,,	7 0	5 0 ,,	7 0	5 0 ,,	7 0	5 0 ,,	7 0	5 0 ,,	7 0
,, Cox's Orange Pippin, per sieve	5 0 ,,	7 0	4 0 ,,	6 0	3 0 ,,	6 0	3 0 ,,	6 0	3 0 ,,	6 0
,, King's per bshl.	5 0 ,,	6 0	5 0 ,,	7 0	5 0 ,,	7 0	5 0 ,,	6 0	5 0 ,,	6 0
,, Various cookers, per bushel	3 6 ,,	6 0	3 6 ,,	6 0	3 6 ,,	6 0	3 6 ,,	6 0	3 6 ,,	7 0
Blackberries, per pk.	2 0 ,,	2 6	2 0 ,,	2 6	2 0 ,,	2 6	2 0	—	—	—
Cobnuts, per lb.	0 3	—	0 3½	—	0 4	—	0 4	—	0 4	—
Grapes, new Hamburgh, per lb.	0 8 ,,	1 0	0 6 ,,	1 0	0 6 ,,	1 0	—	—	—	—
,, ,, B per lb.	0 4 ,,	0 6	—	—	—	—	—	—	—	—
,, Alicante, per lb.	0 6 ,,	1 0	0 6 ,,	1 0	0 8 ,,	1 0	0 8 ,,	1 0	0 6 ,,	1 0
,, Colmars, per lb.	0 8 ,,	1 3	0 9 ,,	1 6	0 6 ,,	1 6	0 6 ,,	2 0	0 6 ,,	2 0
,, Muscats A, lb.	3 0 ,,	4 0	3 0 ,,	4 0	3 0 ,,	4 0	3 0 ,,	4 0	3 0 ,,	4 0
,, ,, B, ,,	0 6 ,,	1 0	0 9 ,,	1 3	0 10 ,,	1 6	0 10 ,,	1 6	0 9 ,,	1 6
Melons, Eng., each	1 0 ,,	3 0	1 0 ,,	2 6	1 0 ,,	2 0	1 0 ,,	3 0	2 0 ,,	3 0
Peaches A, per doz.	8 0 ,,	12 0	8 0 ,,	12 0	—	—	—	—	—	—
,, B ,,	2 0 ,,	4 0	2 0 ,,	4 0	—	—	—	—	—	—
Pears, per sieve	1 6 ,,	4 0	3 0 ,,	4 0	2 0 ,,	4 0	2 0 ,,	4 0	2 0 ,,	3 0
,, stewing, bskts.	3 6	—	3 6	—	3 0 ,,	4 0	3 0 ,,	4 0	3 0 ,,	4 0
Walnuts, bags	5 6 ,,	6 6	5 6 ,,	6 6	5 6 ,,	6 0	5 0 ,,	6 0	5 0 ,,	7 6

DISEASES OF ANIMALS IN GREAT BRITAIN.

NUMBER of OUTBREAKS of **Foot-and-Mouth Disease** and of **Swine-Fever,** with the Number of SWINE Slaughtered by order of the Board of Agriculture, in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Foot-and-Mouth Disease.		Swine-Fever.	
	OUTBREAKS Confirmed.	ANIMALS Attacked.	OUTBREAKS Confirmed.	SWINE Slaughtered as Diseased or as having been exposed to infection.
	No.	*No.*	*No.*	*No.*
March, 1901... ...	10	652	625	3,165
June, 1901	2	17	1,490	7,066
September, 1901 ...	—	—	680	3,391
December, 1901 ...	—	—	345	1,615
March, 1902... ...	1	30	399	2,122
June, 1902	—	88	469	1,976
September, 1902 ...	—	—	455	2,161

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax** and **Glanders** in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Anthrax.		Glanders (including Farcy).	
	OUTBREAKS Reported.	ANIMALS Attacked.	OUTBREAKS Reported.	ANIMALS Attacked.
	No.	*No.*	*No.*	*No.*
March, 1901	163	223	322	571
June, 1901	193	281	327	551
September, 1901 ...	114	165	398	677
December, 1901 ...	181	302	300	571
March, 1902	202	357	285	543
June, 1902	175	268	278	489
September, 1902 ...	143	205	321	544

NUMBER of CASES of **Rabies** in DOGS in GREAT BRITAIN in each of the under-mentioned periods.

THREE MONTHS ENDED.	Number of Cases.
31st March, 1901	1
30th June, 1901	—
30th September, 1901	—
31st December, 1901	—
31st March, 1902	8
30th June, 1902	4
30th September, 1902	—

DISEASES OF ANIMALS IN IRELAND.

NUMBER of OUTBREAKS of **Pleuro-Pneumonia** and of **Swine-Fever**, with the Number of CATTLE and SWINE Slaughtered by order of the Department of Agriculture and Technical Instruction in IRELAND, in each of the under-mentioned periods.

Quarter ended	Pleuro-Pneumonia.			Swine-Fever.	
	Outbreaks Confirmed.	Cattle found Diseased.	Cattle Slaughtered as having been exposed to Infection.	Outbreaks Confirmed.	Swine Slaughtered as Diseased, or as having been exposed to Infection.
	No.	*No.*	*No.*	*No.*	*No.*
March, 1901	—	—	—	64	1,265
June, 1901	—	—	—	67	1,242
September, 1901 ...	—	—	—	72	1,089
December, 1901 ...	—	—	—	24	436
March, 1902	—	—	—	38	644
June, 1902	—	—	—	51	1,168
September, 1902 ...	—	—	—	58	1,109

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax, Glanders,** and **Rabies** in IRELAND in each of the under-mentioned periods.

Quarter ended	Anthrax.		Glanders (including Farcy).		Rabies. Cases Reported.	
	Outbreaks Reported.	Animals Attacked.	Outbreaks Reported.	Animals Attacked.	Dogs.	Other Animals.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
March, 1901 ...	—	—	1	1	1	—
June, 1901 ...	1	2	3	3	—	1
September, 1901.	—	—	—	—	—	—
December, 1901.	1	2	1	2	—	—
March, 1902 ...	—	—	4	13	—	—
June, 1902 ...	—	—	2	8	—	—
September, 1902.	—	—	2	14	—	—

ORDNANCE SURVEY MAPS

The Ordnance Survey are issuing a new series of folding pocket maps for England and Wales on the scale of one inch to the mile. The maps are printed in colours on sheets 18 by 12 inches, mounted on canvas, in a cover or flat, price 1s. each. The one-inch map can also be procured at the same price in black and white, showing outline and contours; or in outline, with hills printed either in black or brown: the outline map has recently been revised. These maps are not only useful for general topographical purposes, but should also prove serviceable to cyclists and pedestrians, since they show all roads, indicating their character and whether metalled or not, footpaths, hills, rivers, towns, villages, railway stations, and local boundaries.

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These combined maps are based on the revised one-inch map. In most cases they are being published folded in covers, and with the principal roads coloured, at prices varying from 1s. to 1s. 6d.

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There are agents for the sale of Ordnance Survey Maps in most of the chief towns, and maps can be ordered and indexes, &c., seen at many Head Post Offices, in places where there are no agents. They can also be ordered, through any bookseller, from the Director-General, Ordnance Survey, Southampton; or, in the case of Ireland, from the Officer in Charge, Ordnance Survey, Dublin.

Small scale pocket maps of the districts round the following towns are supplied to the public at the Head Post Offices in these towns on application without any charge beyond the price of the map, viz.:—Scarborough, Rochdale, Burton-on-Trent, Southport, West Hartlepool, South Shields, Luton, Worthing, Bury St. Edmunds, Huntingdon, Stafford, Macclesfield, Crewe, Stockport, Ilkley, Richmond (Yorkshire), Driffield, Sittingbourne, Cromer, Llandudno, Weymouth, Littlehampton, Greenock, Blairgowrie, and Pitlochry.

A leaflet describing the various editions of the Ordnance Survey Maps may be obtained, post free and free of charge, from the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W.

Geological Survey Publications of Great Britain and Ireland.

The Agents for the sale of Ordnance Survey Maps are also agents for the sale of Geological Survey Publications.

POST OFFICE SAVINGS BANKS, WITH GOVERNMENT SECURITY.

Advantages Offered for Old Age Pensions.

Provision for old age can be made by buying Savings Bank Deferred Annuities from £1 to £100 to begin at any age selected.

Return of Purchase Money. The Premiums for Deferred Annuities can be returned on application, or on Death before the Annuity begins, if the Contract is taken out on these conditions.

Immediate Pensions. Annuities to begin at once, of any amount from £1 to £100 a year, can be bought through the Post Office Savings Bank. The Purchase Money is payable in a lump sum which is not returnable, and the Pensions are payable half-yearly.

Savings Banks Annuities are payable by half-yearly instalments on the 5th January and the 5th July, or the 5th April and 10th October, according to the date of purchase.

Procedure. A simple form of Proposal, and a form for statement of age, can be obtained at any Post Office Savings Bank. When filled up the forms will be forwarded by the local Postmaster to the Chief Office, London, and a Contract will be issued when the first premium has been paid. Annuity Premiums are payable in the same way as Insurance Premiums, namely, by transfers from Savings Bank accounts.

OLD AGE PENSIONS.—IMMEDIATE LIFE ANNUITIES.

This Table shows the cost of an Immediate Life Annuity of £1, and an Annuity of a larger amount costs a larger sum in exact proportion. For instance, a Pension of £10 a year would cost ten times the amount given below.

AGE at time of Purchase.	Males. Cost of an Immediate Annuity of £1.	Females. Cost of an Immediate Annuity of £1	AGE at time of Purchase.	Males. Cost of an Immediate Annuity of £1.	Females. Cost of an Immediate Annuity of £1.
	£ s. d.	£ s. d.		£ s. d.	£ s. d.
5 and under 6	25 19 0	27 12 6	44 and under 45	16 15 8	18 13 3
6 ,, 7	25 15 1	27 9 1	45 ,, 46	16 9 11	18 6 9
7 ,, 8	25 11 1	27 5 8	46 ,, 47	16 4 2	18 0 0
8 ,, 9	25 7 0	27 2 2	47 ,, 48	15 18 3	17 13 2
9 ,, 10	25 2 11	26 18 8	48 ,, 49	15 12 3	17 6 1
10 ,, 11	24 18 10	26 15 1	49 ,, 50	15 6 1	16 18 11
11 ,, 12	24 14 9	26 11 6	50 ,, 51	14 19 11	16 11 9
12 ,, 13	24 10 6	26 7 10	51 ,, 52	14 13 6	16 4 7
13 ,, 14	24 6 4	26 4 1	52 ,, 53	14 7 1	15 17 4
14 ,, 15	24 2 1	26 0 4	53 ,, 54	14 0 5	15 9 11
15 ,, 16	23 17 10	25 16 6	54 ,, 55	13 13 8	15 2 4
16 ,, 17	23 13 6	25 12 7	55 ,, 56	13 6 9	14 14 9
17 ,, 18	23 9 1	25 8 8	56 ,, 57	12 19 8	14 6 11
18 ,, 19	23 4 9	25 4 8	57 ,, 58	12 12 5	13 19 0
19 ,, 20	23 0 4	25 0 8	58 ,, 59	12 4 11	13 11 1
20 ,, 21	22 15 10	24 16 6	59 ,, 60	11 17 4	13 3 1
21 ,, 22	22 11 4	24 12 4	60 ,, 61	11 9 8	12 15 1
22 ,, 23	22 6 9	24 8 1	61 ,, 62	11 2 2	12 7 0
23 ,, 24	22 2 3	24 3 10	62 ,, 63	10 14 11	11 19 0
24 ,, 25	21 17 7	23 19 5	63 ,, 64	10 7 8	11 11 0
25 ,, 26	21 12 11	23 15 0	64 ,, 65	10 0 6	11 2 11
26 ,, 27	21 8 3	23 10 6	65 ,, 66	9 13 4	10 14 7
27 ,, 28	21 3 6	23 5 11	66 ,, 67	9 6 4	10 6 4
28 ,, 29	20 18 9	23 1 3	67 ,, 68	8 19 7	9 18 1
29 ,, 30	20 13 11	22 16 6	68 ,, 69	8 12 10	9 9 10
30 ,, 31	20 9 1	22 11 8	69 ,, 70	8 6 2	9 1 10
31 ,, 32	20 4 2	22 6 9	70 ,, 71	7 19 5	8 14 2
32 ,, 33	19 19 2	22 1 9	71 ,, 72	7 12 10	8 6 10
33 ,, 34	19 14 2	21 16 7	72 ,, 73	7 6 4	7 19 10
34 ,, 35	19 9 2	21 11 5	73 ,, 74	7 0 1	7 13 0
35 ,, 36	19 4 1	21 6 2	74 ,, 75	6 14 1	7 6 4
36 ,, 37	18 18 11	21 0 9	75 ,, 76	6 8 4	6 19 10
37 ,, 38	18 13 9	20 15 3	76 ,, 77	6 2 8	6 13 7
38 ,, 39	18 8 6	20 9 7	77 ,, 78	5 17 4	6 7 5
39 ,, 40	18 3 2	20 3 11	78 ,, 79	5 12 3	6 1 6
40 ,, 41	17 17 10	19 18 0	79 ,, 80	5 7 2	5 15 9
41 ,, 42	17 12 4	19 12 1	80 or any greater age.	5 2 4	5 10 3
42 ,, 43	17 6 10	19 5 11			
43 ,, 44	17 1 4	18 19 8			

LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE.

(*a.*) *Leaflets dealing with Insects and Fungi.*

No.	Title.	No.	Title.
1	The Black Currant Mite.	35	The Celery Fly.
2	Vine and Raspberry Weevils.	38	The Carrot Fly.
3	The Turnip Fly or Flea.	41	The Red Spider or Spinning Mite.
4	Caterpillars on Fruit Trees.	46	The Stem Eelworm.
5	The Mangel Wurzel Fly.	47	The Asparagus Beetle.
10	Wireworms.	48	Pea and Bean Thrips, or Black Fly.
11	The Daddy Longlegs.		
12	The Gooseberry Saw-fly.	49	The Fruit Tree Beetle.
14	The Raspberry Moth.	52	Gooseberry Blight.
15	The Apple Blossom Weevil	53	The Pear Midge.
16	The Apple Sucker.	56	The Canker Fungus.
19	Pea and Bean Weevils.	60	The Wood Leopard Moth.
20	The Magpie Moth.	62	Pear and Cherry Saw-fly.
21	The Warble Fly.	64	White Root Rot.
22	The Diamond-back Moth.	65	The Small Ermine Moths.
23	Potato Disease.	68	Currant Aphides.
24	The Ribbon Footed Corn-fly.	69	Tent Caterpillars.
25	Chafer-beetles or White-Grubs.	70	Winter Washing of Fruit Trees.
30	The Codlin Moth.	71	The Colorado Beetle.
31	The Onion Fly.	75	Root-knot Eelworm in Cucumbers and Tomatoes.
33	Surface Caterpillars.		
34	The Woolly Aphis or Apple Root Louse.	76	Cucumber and Melon Leaf Blotch.
		77	Finger-and-Toe in Turnips.

(*b.*) *Leaflets dealing with Birds useful to Agriculture.*

40	The Kestrel or Wind-hover.	45	The Starling.
42	The Short-Eared Owl.	50	Water Wagtails or "Dishwashers."
43	Titmice.	51	The White or Barn Owl.
44	The Common Lapwing, Plover, or Peewit.	54	The Spotted Flycatcher.
		55	The Swallow.

(*c.*) *Leaflets dealing with Diseases of Animals.*

28	Anthrax.	37	Rabies. (*Out of Print.*)
29	Swine Fever.	61	Sheep Scab.

(*d.*) *Leaflets relating to Acts of Parliament.*

8	Farmers and Assessments to Local Rates.	26	Farmers and the Income Tax.
		27	Remission of Tithe Rentcharge.
17	Preservation of Commons. (*Out of print.*)	39	Assessment to Land Tax.
		59	Improvement of Land Act, 1899.
18	Fertilisers and Feeding Stuffs Act.	66	Workmen's Compensation Act, 1900.

(*e.*) *Leaflets dealing with Miscellaneous Subjects.*

6	Voles and their Enemies.	57	External Parasites of Poultry.
7	Autumn Catch Crops and Fodder Supply. (*Out of print.*)	58	Internal Parasites of Poultry.
		63	Destruction of Charlock.
9	Ensilage.	67	Favus in Poultry.
13	Acorn Poisoning.	72	Purchase of Artificial Manures.
32	Foul Brood or Bee Pest.	73	Cultivation of Maize for Fodder.
36	Cultivation of Osiers.	74	Purchase of Feeding Stuffs.

Copies of these Leaflets may be obtained free of charge and post free on application to the Secretary, Board of Agriculture, 4, *Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.*

THE JOURNAL
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THE USE OF ARTIFICIAL MANURES.

The issue of this *Journal* for March, 1902, contained an article setting forth some of the points that a farmer may with advantage consider in purchasing artificial manures. The present article is designed to supply practical information in regard to the use of these substances.

In giving general recommendations on the subject of manuring, it is to be borne in mind that, although the advice offered may be serviceable in the majority of cases, it will certainly not be applicable to exceptional circumstances. Farmers who manure on general principles will, no doubt, usually be right, but those who are dealing with soil of an exceptional character, or with a farm that has been managed in an exceptional manner, may be led very far astray by blindly following general principles. Take, as an example, the manuring of meadows. The teachings of Rothamsted, and of several other experimental stations, show that, as a rule, potash is a most important ingredient in a manurial mixture, and yet there are cases where this substance does harm rather than good when used for meadow hay. Or, take the effects of this substance on the turnip crop. As a rule it is necessary, and its use will leave a profit, though it cannot be said that, in the majority of cases, its presence or absence is a matter of vital importance. But there are cases where potash is the most important element of all in the treatment of this crop; so much so, indeed, that the most liberal applications of nitrogen and phosphates may be absolutely without effect if unsupported by potash.

It is, therefore, the first duty of a farmer to ascertain what the

manurial requirements of his own particular holding may be. And, not only so, but if his land is variable in character he should take steps to become acquainted with the peculiarities of every field. To rest satisfied with less is to conduct his business in a haphazard fashion. His practice may be right, but there is a great chance that it will be wrong, and a serious error in judgment may result in heavy pecuniary loss. To some it may seem an extreme recommendation to make that every farmer should be an experimenter, but nothing less will meet the necessities of the case. What with the extra labour involved in measuring and weighing, and the loss in yield that some of the methods of treatment may entail, experimenting cannot be done without expense; but for ordinary practical purposes £5 will go a long way towards obtaining information that may be worth many times this sum. The land must be measured, and the manures must be weighed and properly mixed and applied, and although the experiment cannot be said to be complete till the produce has been weighed, an experienced farmer can often estimate with the eye with sufficient accuracy what the result of his experiments has been.

The set of experiments known as "The Eight Plot Test" is that which gives the greatest amount of information for the number of plots involved. It supplies four answers to each of the three questions: Shall I use (*a*) Nitrogen? (*b*) Phosphate? (*c*) Potash? It may be carried out with any nitrogenous manure (*e.g.*, nitrate of soda or sulphate of ammonia), with any phosphatic manure (*e.g.*, superphosphate or basic slag), and with any potassic manure (*e.g.*, kainit or sulphate of potash). Suppose that the first-mentioned of each of these pairs is employed, and that the crop is turnips, the eight plots may be treated per acre as follows:—

1. No manure.
2. 1 cwt. nitrate of soda.
3. 5 cwt. superphosphate.
4. 3 cwt. kainit.
5. 1 cwt. nitrate and 5 cwt. super.
6. 1 cwt. nitrate and 3 cwt. kainit.
7. 5 cwt. super. and 3 cwt. kainit.
8. 1 cwt. nitrate, 5 cwt. super., and 3 cwt. kainit.

When the crop is mature, it will be possible to ascertain the effects of nitrate as follows :—

Compare Plots 1 and 2 for the result of using nitrate alone.

Compare Plots 3 and 5 for the result of using nitrate with super.

Compare Plots 4 and 6 for the result of using nitrate with kainit.

Compare Plots 7 and 8 for the result of using nitrate with both super. and kainit.

Similar information may be got for super. by taking the plots as follows :—1 and 3, 2 and 5, 4 and 7, 6 and 8 ; and for kainit by taking Plots 1 and 4, 2 and 6, 3 and 7, 5 and 8. By omitting three plots (2, 3, 4), and having only five (1, 5, 6, 7, 8), information sufficiently serviceable for many purposes will be obtained, for the test will show the effect (*a*) of using a general mixture (compare Plots 1 and 8), (*b*) of omitting nitrogen (compare Plots 8 and 7), (*c*) of omitting phosphate (compare Plots 8 and 6), (*d*) of omitting potash (compare Plots 8 and 5). By adding a few plots to either of these sets, supplementary information may be got in regard to the best kind of nitrogen, phosphate, or potash, and, further, as to the best quantity.

The Manurial Treatment of the More Important Crops.

The basis of all systems of manuring should be dung. This does not mean that this substance should be applied concurrently with artificial manures, but merely that land from which crops are taken should periodically receive a fair dressing of this fertilizer. Where straw, hay, and roots are consumed on a farm, enough dung will be produced to allow of about one-fourth or one-fifth of the area of arable land and meadows being dressed annually with 10 to 15 loads per acre. As regards the arable land, the dung is applied in some districts to the roots (North of England, Wales, Scotland), in others it is given to the wheat (where bare-fallowing is practised), while elsewhere it may go on to the barley stubble for the seeds, hay (Suffolk), or be used in other ways. Although on land that naturally grows strong straw the supply of dung may alone maintain a farm in fair fertility, it seldom, if ever, happens that the home-made supplies

suffice to produce maximum crops throughout a rotation. For this reason it is found to be profitable to purchase artificials, which, however, should be regarded as a supplement, not as a substitute, for the natural fertiliser. The larger crops that these artificials produce mean, of course—if the crops are consumed at home—a larger dung-heap, so that when once a farm has been brought up to a high state of fertility it is prudent to curtail the manure bill.

Cereals.

Wheat receiving 10 loads or upwards of dung per acre seldom needs artificials, and the same is usually true where this crop follows a well-dunged root crop, or a good clover root. Where artificials are used, nitrogen is the most important element, and, as wheat usually occupies strong land, nitrate of soda (1—2 cwt. per acre) is preferable for use in spring to either sulphate of ammonia or organic manures. Sometimes it is desirable to help a weak plant in autumn, and then 1 cwt. of sulphate of ammonia or 2 cwt. of rape dust or fish meal may be used. The residues from applications of phosphates to the root crop usually make the direct use of such manures for wheat unnecessary. On the lighter classes of wheat soils, and especially in the later districts, 2 cwt. per acre of superphosphate applied in autumn, by improving quality and hastening maturity, may be profitable. Potash is practically of no importance in the manurial treatment of this crop.

Barley responds readily to nitrogenous dressings, but as it is easily laid, and is often put in with "seeds" which thrive best under a light crop, it is not often top-dressed. Moreover, barley generally follows a well-manured root crop, often folded with sheep, so that the land is in good condition. It is also to be remembered that the grain is apt to be horny or flinty when grown with too much nitrogen, so that an increase in yield may be more than discounted by a reduction in quality. A fine sample of barley, though a small yield, is often got after a wheat crop, largely because the soil is thereby to a great extent depleted of its surplus supplies of nitrogen.

If the field is in low condition, and especially if a short-stemmed, stout-strawed variety is grown—more particularly in a

district where the best class of brewing barley cannot be hoped for—a moderate dressing of nitrogen may be given; and, as barley soils are usually light, sulphate of ammonia ($\frac{3}{4}$—1 cwt. per acre) will suit better than nitrate of soda. To improve the quality, though also to add to the bulk, both phosphates and potash may frequently be used with advantage, but it is very necessary for the farmer to determine the point by experiment. On typical barley soils dissolved bones and Peruvian guano are also suitable. A barley manure may therefore consist of about (per acre) :—

$\frac{3}{4}$ cwt. sulp. ammon. } or 3 cwt. dis. bones
2 cwt. super. } or $1\frac{1}{2}$ cwt. Peruvian guano
2 cwt. kainit

All of which may be mixed together and applied with the seed.

Oats are often grown on the poorest classes of tillage land, and, moreover—coming, as they do in many cases, before roots, and therefore removed as far as possible from the point in the rotation when dung is used—they find but small supplies of food in the soil. They are often, too, sown after land has been some years in grass, and when, consequently, there is a tough sod; and a heavy straw crop can do much to mellow the soil and make it work down kindly for the following root crop. If, as is often the case, oats are grown in a wettish district, sulphate of ammonia (say 1 cwt. per acre) may be used. In other cases, and especially if a weak plant is to be helped by top-dressing, nitrate of soda (1—$1\frac{1}{2}$ cwt.) will be more serviceable. Phosphates will not usually add much to the bulk, but they will make harvest somewhat earlier, and in a typical oat district this is of importance. Two cwt. of superphosphate may therefore often be used with advantage. Only on very light land is it likely that potash will pay on this crop.

Rye is too unimportant to be treated in detail, but as it is usually grown on the lighter and poorer soils it may be treated as for oats.

Maize is now grown to a considerable extent for fodder. It should either follow a well-dunged root crop or receive a moderate direct dressing of dung. In either case the artificials may consist of 1 to 2 cwt. of nitrate of soda or sulphate of ammonia, and 2 to 3 cwt. of superphosphate.

Green and Root Crops.

Mangolds: The basis of manuring for this crop should be dung, applied in autumn if the land is clean, or in spring. Supplementary to this manure a mixture of artificials, such as 1 cwt. sulphate of ammonia, 3 cwt. superphosphate, and 4 cwt. kainit, should be given at the time of sowing, with 1 cwt. or 1½ cwt. of nitrate of soda as a top-dressing at the time of thinning. Half the sulphate of ammonia and the whole of the superphosphate may be replaced by 3 cwt. of dissolved bones. If basic slag be used in place of superphosphate, it should be put on broadcast in February. One of the most conspicuous results at Rothamsted consists in the superior action of nitrate of soda as compared with ammonia salts on this crop, but on lighter land sulphate of ammonia would probably act better. This, however, is a matter which each farmer should determine for himself. Salt, no doubt, sometimes acts well on mangolds, but the use of this substance seems unnecessary where kainit is used, as one-third of the latter consists of ordinary salt.

If the crop be grown without dung, the artificials above indicated should be increased by half, and may sometimes even be doubled.

Turnips, Swedes, and **Kohl Rabi,** may, in general, be treated like mangolds, except that they need not get so much dung or nitrogen, but they should receive relatively more phosphates. If 10 or 12 tons of good dung be used, the supplementary artificials need not exceed ½ cwt. nitrate of soda and 3 cwt. super. Even this moderate allowance will often fail to pay directly, but the super. will have some influence on the next crop. If the land be very light, kainit up to 3 cwt. per acre may be used, not so much for its effect on the roots as for its influence on the clover that may follow.

In the absence of dung these allowances should be at least doubled; or, better still, ½ cwt. of sulphate of ammonia may be applied with the seed, and ½ cwt. nitrate of soda may go on a month later as a top-dressing. If the land is very light, fish meal, rape dust, or dissolved bones may partly replace the more soluble substances. If the land is at all disposed to finger-and-toe it is well not to use either superphosphate or dissolved bones.

An equivalent expenditure on basic slag (or bone meal, very finely ground, if the land is sandy) will, on such land, produce a sounder crop. Precipitated phosphate is also an excellent fertiliser under these circumstances, but it is not always easy to procure. Potash in some form is usually necessary in the absence of dung, and in many cases it is absolutely essential. Four or 5 cwt. of kainit, or a corresponding quantity of sulphate or muriate of potash, will usually suffice. Needless to say, if part or all of the crop is to be folded on the land, the manurial treatment may be less liberal.

Rape, Thousand-headed Kale and **Mustard,** speaking generally, require more nitrogen and less phosphates than the last-mentioned crops, but on fen land the nitrogen need only be used sparingly. As these crops are generally consumed where they grow they need not get farmyard manure.

Cabbages are treated in a variety of ways, but as a rule they should get a liberal dressing of dung, together with 3 or 4 cwt. of superphosphate and as much kainit. When the plants are fairly established, 2—3 cwt. per acre of nitrate of soda, applied in "pinches," or by means of a spoon round the base of each separate plant, should be given. This is a somewhat slow process, but to broadcast nitrate on a crop, where the plants may be two or three feet apart, must be wasteful of manure.

Potatoes, being worth so much more than an equal weight of roots, should be more liberally treated as regards manure. Under ordinary circumstances farmyard manure (15 to 20 tons per acre) should be the basis, supplemented by much the same kind and quantity of artificials as in the case of mangolds, omitting, however, any top-dressing. On the whole, kainit is not the best potassic manure for potatoes, sulphate and muriate of potash often proving superior both as to quantity and quality.

If there is abundance of organic matter in the soil, as, for instance, when potatoes are taken after a two or three years ley, artificials alone will, in many cases, grow a full crop of potatoes.

In view of the valuable nature of the crop, and especially in the case of early potatoes, farmers can not only afford to manure liberally, but it will also pay to compound more complex

mixtures than in the case of less valuable crops. The following mixture will be found generally serviceable :—

½ cwt. nitrate of soda.

½ cwt. sulphate of ammonia.

2 cwt. dissolved bones.

2 cwt. super.

1 cwt. sulphate or muriate of potash (about 70 per cent. purity).

It would be an improvement, though involving a little more trouble and expense, to use only ¼ cwt. of nitrate of soda and ¼ cwt. sulphate of ammonia, and to add ½ cwt. of fish guano, and cwt. of Peruvian guano. Five to 8 cwt. per acre of such a mixture may be used with, or double this quantity without, a liberal dose of dung.

The slowness of action and presence of free lime in the case of basic slag render this manure unsuitable for use on potatoes.

Carrots and **Parsnips** are usually grown on light or peaty land, and a good artificial mixture would consist of 1 cwt. of sulphate of ammonia, 4 cwt. of superphosphate, and up to 5 cwt. of kainit. Whether farmyard manure should be directly used will depend on the character of the land and its previous treatment.

For fifty miles round London, and also in other parts of the country, soot at the rate of 5—10 cwt. per acre is largely used, especially on crops that are apt to suffer severely from the attack of insects and slugs, *e.g.*, cabbages, turnips, carrots. Soot supplies nitrogen, of which about 5 cwt. hold about as much as 1 cwt. of nitrate of soda, and besides acting as an insecticide and fertiliser, it darkens the soil, and from the point of view of temperature this is often an advantage.

Leguminous Crops.

Beans and **Vetches** often receive dung, and although this substance will markedly benefit such crops, it can usually be more advantageously employed otherwise. In an artificial mixture for these and other leguminous crops, nitrogen should be omitted, not because it may be altogether inoperative, but simply because they generally grow sufficiently well without it.

Five to 7 cwt. of superphosphate or basic slag, and about 4 cwt. of kainit, or an equal money value of some other potassic manure, will usually prove a serviceable dressing.

Peas should receive no dung, partly because its nitrogen induces the growth of weeds, which are not easily kept down in this crop, and partly because it forces a rank growth of straw and retards the filling and ripening of the pods. The phosphates recommended for beans and vetches may be used on peas, while the potash—peas being generally grown on light land—may be somewhat increased.

Beans, vetches and peas are all lime-loving crops, and for this reason basic slag is well suited to their requirements. On soil poor in lime dressings of lime will produce a good effect, but it is better only to grow these crops on land naturally well supplied with this substance.

Lucerne, Sainfoin and **Pure Clover** do best when they are put in after a well-dunged and thoroughly-well-cleaned root crop, but they should not be directly treated with dung. Phosphates and potash are all-important for these crops. There should be, to begin with, a considerable residue of these substances in the land, the result of dressings applied to the previous crop—usually roots. Such residues are incorporated with the soil in a manner that is difficult, if not impossible, of attainment with direct dressings. As regards immediate applications, some 5 cwt. of basic slag and $2\frac{1}{2}$ cwt. of kainit may be applied in autumn, and as much more kainit, together with 3 or 4 cwt. of superphosphate in spring. When a good stock of the necessary plant-food has been got up in the soil the dressings need not be so liberal.

Hay and Pasture.

Seeds, Hay.—Excluding sainfoin, lucerne, and pure clover, hay on tillage land is usually got from pure grass (ryegrass, timothy, cocksfoot, &c.), or from a mixture of grass and clover. The manuring of such crops must depend on the character of the plants and of the land. If clover is absent or very scarce it may be disregarded, and attention be wholly directed to stimulating the grass. In this case nitrogen in some form will be the main fertilising element. Thus, on an ordinary loam or clay, 1 to 3 or

even 4 cwt. of nitrate of soda—applied, in the case of the larger dressings, in two doses—will generally suffice, while on lighter soils sulphate of ammonia may partly replace the nitrate. In the latter case, and on peaty soil, a little superphosphate and kainit (say 2 cwt. of each) may be used. Here as elsewhere, however, the farmer should determine the matter by private experiment.

Where there is a good "take" of clover the nitrogenous dressing must be much curtailed or the clover will be smothered by the luxuriant growth of grass, and the aftermath is likely to be poor. On the other hand, phosphates and potash become of relatively greater importance. With a fair take of clover 1 cwt. nitrate of soda, 2 cwt. superphosphate, and 2 cwt. of kainit is likely to prove suitable; while with a strong and abundant clover plant the nitrate may be reduced by half, or even omitted, while the kainit may be nearly doubled, and the phosphates should be increased by the use of about 3 cwt. of basic slag applied early in autumn.

Meadow Hay should, if possible, get about 10—12 tons of dung per acre, applied in autumn, every four years, artificials being either omitted in these years, or, at most, consisting of about 1 cwt. of nitrate of soda applied in spring. In the intervening years 3 or 4 cwt. of basic slag in autumn, and 1 cwt. of nitrate of soda in spring, will generally pay, though in many cases the slag need only be used every second year. These quantities may be reduced if the aftermath is fed by stock getting cake. Whether potash should be used in the years between the dressings of dung must be determined by each farmer for himself. It would appear, as a rule, to be unnecessary, though this is not always the case.

Where meadows cannot get dung the treatment should be materially different. If the land is found to respond to basic slag it should get a liberal dressing (up to half a ton per acre) in autumn, and for the next two or three years—that is to say, till the clover begins to fail—nothing more need be given. After that time attention should be given to forcing grass, as distinguished from clover, and this may be done by annually using about 1 cwt. nitrate of soda per acre. After two or three years of such treatment, that is to say, five or six years after applying the slag, the land will again be in a position to grow clover,

when a liberal dressing of slag (say 5—7 cwt. per acre) should be given, followed in subsequent years by nitrate of soda as before.

If the land is not of the character that responds to slag the treatment should consist of annual dressings of a general mixture of artificials, such as 1 cwt. nitrate of soda, 2½ cwt. superphosphate, and 2½ cwt. of kainit. Needless to say, other sources of nitrogen, phosphates, and potash may also be resorted to.

Pastures should only receive nitrogenous manure if an "early bite" for lambs or cows in spring is of great importance. In other cases phosphates—sometimes with the addition of potash—should alone be used. On land that suits basic slag the treatment may be either about half a ton per acre of this substance every six or eight years, or about a quarter of a ton every three or four years. Which system will pay best can only be determined by trial, but at least it may be said that in the Cockle Park experiments the former has proved much the better. Where a heavy dressing of slag is applied every six or eight years it is an excellent plan to give cake to the stock—especially from the middle of July—from the third or fourth year onwards. In the case of lighter dressings at shorter intervals it may pay well to use cake in the autumn and late summer of every season. If the land is not of a character to grow abundance of clover, moderate dressings of superphosphate or slag (3 or 4 cwt. per acre) possibly with 2 or 3 cwt. of kainit, applied every three or four years, with the use of cake during the latter part of each season, may be recommended. On very light land fine bone meal sometimes acts fairly well, but here, again, knowledge derived from experiment will prove the best guide.

General Hints on the Use of Manures.

Of hardly less importance than the selection of manures is their distribution. Whatever the amount of manure that may be employed, care should be taken to have it spread equally over the area for which it is intended. One should take pains to secure good mechanical condition, and to do this it may be necessary to pass the stuff through a half-inch riddle, breaking all the lumps that fail to go through. Some manures, *e.g.*,

kainit and sulphate of ammonia, go into hard, almost rock-like masses if stored for some months, and when in this condition the expense of pulverising them is no small matter. This is one reason why it is seldom desirable to store manure for a long period. If this has to be done the addition of a small proportion of peat-litter dust or sawdust will make the substance more friable. The necessity of insisting on good mechanical condition is evident from the fact that one often sees artificial manure being sown containing lumps as large as a walnut and sometimes as large as a cricket ball. Not only does the presence of lumps prevent much of the crop getting its fair share of the dressing, but the spots on which the lumps fall are actually poisoned, so that the plants are weakened or killed outright. The loss from the latter cause is greatest in the case of such a crop as clover, and with highly soluble manures like nitrate of soda. Patchy distribution is also very serious where it is specially desirable to produce a uniform crop, as in the case of barley. The danger of loss from washing into the drains or subsoil is also greater where distribution is defective.

Besides lumps, unequal distribution may be brought about by wind, by an unskilful workman, or by an attempt to put on a large dressing by a single "cast." Too often one sees the sower attempting to put on so much that directly his hand clears the edge of the sowing-sheet a considerable amount of manure falls at his feet. The effects of such work may be afterwards traced in brown and withered lines of crop running parallel across the field.

Unequal distribution of another kind is met with where a farmer gives a large dressing to one field, or one part of a field and a small dressing elsewhere. Needless to say, this is quite a rational proceeding where the land is known to vary markedly in fertility. But sometimes, owing to miscalculation or otherwise, one finds a farmer, for no sufficient reason, giving a liberal allowance of manure to part of his crop and a small allowance to the rest. Now, it is an incontrovertible principle in manuring that the profits from a small or moderate application per acre of manure are relatively greater than in the case of a large dose. For instance, it must pay better—other things being equal—to put 20 cwt. of nitrate of soda on to 20 acres at the rate of 1 cwt.

per acre, than to apply 1½ cwt. per acre to 10 acres, and ½ cwt. to the other ten. Or the case may be stated thus: if 1 cwt. of nitrate of soda applied to an acre can increase the oat crop by 5 bushels, 2 cwt. per acre will produce less than 10 bushels.

After artificial manure has been applied, it should, if the state of the crop admits of it, be chain-harrowed. If the manure is a soluble one, this operation must be done at once, or much of it may have gone down into the soil, where, of course, it is beyond the reach of further mechanical distribution, but in the case of an insoluble substance, like basic slag, there is not the same need for haste.

Where possible, manure should be thoroughly incorporated with the soil. This is of greatest importance in the case of insoluble manures, and of those, notably dung, which act to a large extent through the improvement that they effect in the physical condition of the soil. Manifestly there may be no choice but to spread the manure on the surface of the ground and to leave it there, but where it is possible to work it in this should be done. For instance, where artificials are being applied to a corn crop at the time of sowing, they should be put in with the seed so that they may get the benefit of the subsequent harrowing.

Finally, a word of caution may be given as regards the mixing of artificials. Probably it is now universally known that sulphate of ammonia must not be mixed with any manure holding free lime, notably basic slag and precipitated phosphate. The immediate result of making such a mixture is the liberation of free ammonia, whose presence in the air can at once be detected by its pungent odour. If it is desired to apply sulphate of ammonia with one of these substances to any particular area of ground, the phosphate should be put on a month or more before the other substance. Sulphate of ammonia may, however, be mixed with the other ordinary manures, such as superphosphate, dissolved bones, bone meal, kainit, sulphate and muriate of potash, and nitrate of soda. Nitrate of soda should not be mixed with superphosphate, dissolved bones, or dissolved guano. Not only does such a mixture result in the loss of more or less nitrogen, but the mass is apt to become sticky and difficult to sow. Superphosphate and dissolved bones should not be mixed with basic slag or precipitated phosphate,

as this results in the soluble phosphate of the super. or dissolved bones becoming insoluble.

Potash manures (kainit and sulphate and muriate of potash) should not be mixed for more than a few hours with any "dissolved" manure (*e.g.*, superphosphate and dissolved bones), not because anything is lost, but simply because the mass becomes smeary and unsowable.

Generally speaking, the sooner a mixture of manures is sown after it is made the better. Some mixtures, as has been indicated, get smeary, others get lumpy, while others, like basic slag and kainit, may actually become a hard, solid, stone-like mass, which the ordinary appliances of the farmer are insufficient to deal with.

CONDITIONS AFFECTING THE CHARACTER OF BUTTER-FAT.

Butter-fat, which belongs to the class of compounds known as glycerides—that is, combinations of glycerin with certain acids—is, like many other products of animal metabolism, a substance of varying composition, and the nature and relative proportions of its constituent glycerides are affected by a number of causes. Thus they are dependent upon the idiosyncracy of the cow, the changing conditions of its existence, the nature and amount of its food, the period of lactation, &c., &c. As is well known, the nervous organisation of the animal has also an important influence on the milk secretion, but to what extent it affects the proportion or character of the glycerides in the milk-fat is not definitely made out. In fact, the precise influence of all these agencies on the chemical composition of butter has been very imperfectly studied, mainly by reason of the tedious and imperfect nature of the analytical processes which are used to isolate and determine the nature and amount of the constituent glycerides. It has, however, been established that the proportion of olein is greatest in the early period of lactation. In some cases it may amount to as much as half the weight of the fat. After a certain period the palmitin and stearin increase, the amount of olein falling to less than half its maximum quantity. These changes are apparently associated with the variation in the size of the fat globules which occurs during the lactation period. As the globules decrease in size the proportion of olein also decreases, and the fat becomes harder and of higher melting-point.

During the last five-and-twenty years a considerable body of analytical evidence has been accumulated concerning the influence of these factors of change upon certain physical and chemical characteristics of butter-fat, from which a limited number of important deductions are possible. This evidence

has been accumulated concurrently with the rise and development of the margarine industry, and largely in consequence of it.

The fat of margarine mainly consists of glycerides of stearic, palmitic, myristic, &c., acids, and is distinguished from the fat of butter by the absence or practical absence of acids of relatively low molecular weight.

The amount of iodine absorbed, calculated as a percentage on the fat, is generally referred to as the "*iodine number*" or the "*Hübl number*" of the fat.

Other points of contrast depending upon differences in the chemical composition of the two fats are found in their different deportment with certain solvents. Thus, if equal weights of butter-fat and margarine-fat be separately dissolved in similar volumes of hot acetic acid, and then allowed to cool, the glycerides of margarine begin to crystallise out, and render the liquid turbid, at a considerably higher temperature than do those of butter. This test with acetic acid is known as the "*Valenta*" test, after its discoverer. A somewhat similar experiment, in which alcohol is used as the solvent, is known as "*Crismer's test*," and the temperature of turbidity as the "*Crismer number*." Moreover, different quantities of heat are evolved by the two fats when, under like conditions, their glycerides are chemically decomposed by treatment with strong sulphuric acid.

These differences in the chemical composition of butter-fat and margarine are accompanied by certain differences in physical properties of which advantage may be taken by the analyst. Thus butter-fat has almost invariably a higher relative density than any of the fats which are likely to be used to adulterate it. Its refractive index also is lower than that of any probable adulterants. This latter constant, as measured by the optical instrument most generally used, is known as the "*Zeiss number*." As a rule, the lower the proportion of volatile acids in butter-fat, the higher is the Zeiss number. Its value for normal butter-fat at 45 deg. C. ranges from about 38 to 43 divisions on the graduated scale attached to the instrument.

Founded upon the foregoing facts, various analytical processes have been devised in order to discriminate between butter and

margarine, or between genuine butter and mixtures of butter and margarine. The following is a summary of the essential features of the methods, some or all of which are usually followed by the analyst in his examination of samples of butter:—

(1) *Determination of Soluble and Insoluble Acids.*—In this process a small quantity of the butter-fat, separated from water and curd, is saponified by heating with an alcoholic solution of potash. By this treatment the fatty acids of the glycerides are liberated from their combination with the glycerin, and combine with the alkali to form a soap. From this soap, dissolved in hot water, they are set free by the addition of sulphuric acid, and on cooling the mixture, the "insoluble fatty acids" are obtained as a solid cake upon the surface of the liquid, whilst in the latter the "soluble fatty acids" remain dissolved. The insoluble acids are separated from the liquid by filtration, washed with water to remove adherent soluble acids, dried, and weighed. The quantity of insoluble acids thus obtained, expressed as a percentage of the butter-fat, is usually referred to as the "*Hehner value*" of the butter, and in normal samples may range from about 86½ to 89. In margarine the value is about 95.

The soluble acids are contained in the liquid which has been filtered from the cake of insoluble acids. In order to ascertain their amount this acid liquid is neutralised with a standard solution of alkali, of which the volume required is carefully noted. The quantity of standard alkali used, after being corrected for the known amounts of potash and sulphuric acid employed in the earlier stages of the experiment, is a measure of the soluble acids in the liquid, and the weight of these acids can be at once calculated from the result obtained. As a rule the soluble acids are from about 4½ to 7 per cent. of the butter-fat, whereas in margarine the figures are much lower, and usually less than 1 per cent.

(2) *Volatile Fatty Acids.*—In determining the amount of these acids the butter-fat is first saponified and treated with sulphuric acid, as already described for the insoluble acids. Mixed with water in a flask, the free fatty acids thus obtained are distilled, and the volatile members are in this way separated from the "fixed" or non-volatile acids. They are collected, together with the condensed steam, in a receiver, filtered from such small

quantities of insoluble acids as may have also distilled over, and the amount of the dissolved volatile acids is then determined by neutralising the acid liquid with standard alkali.

This process, in one modification or another, is variously known as the *Reichert*, the *Reichert-Meissl*, or the *Reichert-Wollny* method of determining the amount of volatile acids in fats.

Before, however, any valid inference as to the amount of admixed margarine can be drawn from data obtained by the foregoing methods, it is necessary to have precise information as to the differences in these respects which genuine butter is liable to exhibit under the varying conditions in which it is produced. As the result of applying these tests to butter produced under known conditions, it has been found that butter-fat, derived from cows nearing the end of their lactation period, is invariably poor in acids of low molecular weight—that is, in volatile acids. Hence the butter obtained at such periods gives low Reichert-Wollny figures.

This was first clearly indicated by the late Professor L. F. Nilson, of Stockholm, who some years ago (*Zeitschrift fur Analytische Chemie*, vol. 28) published the results of the analyses of over 800 samples of butter, obtained from the milk yielded by a herd of 15 cows. He found:—

(1). That in the fat of colostrum the proportion of volatile acids is very low.

(2). That the amount of these acids then rapidly increases, and reaches a maximum in from five to seven days after the cows have calved.

(3). That the volatile acids then gradually diminish until the close of the lactation period; although even at the end of this period the figure shown was rarely less than 26. The lowest value obtained was 25.

It has also been observed that cows exposed to cold, wet, or inclement weather give butter containing a relatively small proportion of butyric acid and its near homologues. Scanty pasture, too, is conducive to a lowering of the amounts of the volatile acids.

The joint effect of these influences is well illustrated in the character of a certain amount of Dutch butter produced during the autumn—say from the latter part of September to the early

part of November. At this time of the year the cows over a great part of Holland are, as a rule, nearing the end of their lactation period, the weather is usually unsettled, the nights cold, and the pasturage scanty. The milk-fat produced under such conditions is frequently so low in volatile acids as to give rise to the supposition that the butter has been mixed with margarine. After the cows are stabled, and in receipt of their usual winter food, the butter-fat quickly re-acquires its normal complement of the characteristic fatty acids of butter.

These results were confirmed by a Commission appointed in 1899, at the instance of the French Minister of Agriculture. Their conclusions are as follows (*Bulletin du Ministère de l'Agriculture*, 1901, p. 327):—

1. Certain Dutch butters, during the months of October and November, show a composition sensibly different from that of French butters, and approaching that of butters adulterated with margarine.

2. This occurs only at one well-defined period of the year, for about 2½ months (September 15th to the end of November).

3. It would be wrong to generalise this fact, as certain interested persons have a tendency to do, and to extend it to the whole butter produce of the Netherlands; in this country, indeed, even at this particular period of the year, there are a large number of butters having a normal composition.

4. The lowering of the content of volatile acids in certain butters is due to the defective conditions under which the cows at grass are living; at a time when they are subjected to cold and damp they also are receiving insufficient nourishment.

Taking into consideration the whole of our observations, it is clear that Dutch butters might have, all the year round, a normal composition if the herds were stabled at the first approach of cold, and thus sheltered from inclemencies of the weather, and fed in a more suitable manner.

5. The defective conditions under which the cows are living at the time when they furnish butters poor in volatile acids, gives us the right to consider these products as "abnormal."

Indeed, if the chemical expert, confronted with a butter poor in volatile acids, of Dutch origin, and manufactured during the months in question, cannot conscientiously state that this product has been adulterated with margarine, it is, on the other hand, his duty to declare that it is an "abnormal butter." In fact, on comparing it with the butters of our own country, he has the right to affirm that in France this butter is not a marketable product.

It follows from what has been stated that if the Dutch farmers could be induced to stable their cows at the first approach o winter and provide them with a more plentiful supply of nourishment than they are able to obtain from the meadows in the late autumn, their butter would tend to have the same uniformity of character that distinguishes the product of their chief competitors in the English market.

Some interesting particulars relative to this question have been furnished me by the late Dr. Werenskiold, of the State Laboratory, Christiania. He forwarded the details of the analyses of a considerable number of samples of butter taken from the churns of various factories in Norway by the Government inspectors; and with these details are supplied certain facts respecting the stabling and feeding of the herds which produced the milk used by the factories in question. It may be mentioned that a number of Norwegian samples, stated to be the same butter as many of those referred to by Dr. Werenskiold, have been examined in the Government Laboratory, London, and that this department has substantially confirmed the analytical figures obtained in Norway.

First come two series of samples, one taken in the winter and the other in the early spring, which, presumably—though this is not expressly stated—represent the normal composition of the butter when the cows are properly stabled and fed. For the present purpose the results may be thus summarised:—

Butter taken from the churns at various factories by the Norwegian Inspectors:

No. of Samples.	Date of Sampling.	Reichert-Wollny Figures.			Zeiss Number.		
		Lowest.	Highest.	Average.	Lowest.	Highest.	Average.
18	15th Nov. to 23rd Dec., 1898.	26·8	34·7	30·4	38·8	39·9	39·3
8	22nd April to 3rd May, 1899.	29·8	31·9	31·2	39·2	41·0	39·9

Bearing in mind that the Reichert-Wollny value for butter of normal composition lies generally between 24 and 32, whilst the Zeiss number may vary from about 43 to 38, it will be seen that the figures indicate that the butters are normal samples in all cases.

The next series of samples deals with a little later period, extending up to the end of May. Dr. Werenskiold's remarks relative to one of the farms may be quoted as fairly typical of the particulars furnished for eleven out of the twelve samples referred to:—

"The spring came very late this year, so the fodder has run short, and the cows have been underfed; their condition is not good, but their health is all right. They had to be turned on pasture already from the middle of May or a little later; on the

24th May most of them were on pasture. It is reported to me on the 24th and the 31st that the weather had been cool and wet during the last three days before the samples had been taken."

The results of the analysis of this series were as follows:—

No. of Samples.	Date of Sampling.	Reichert-Wollny Figures.			Zeiss Number.		
		Lowest.	Highest.	Average.	Lowest.	Highest.	Average.
12	5th May to 31st May, 1899.	22·5	31·5	26.9	39·9	43·2	41·9
Some individual samples ...		22·5				43·2	
		23·8				42·8	
		24·1				42·9	

Comparing these results with those for the first two series, it will be seen that, coincident with the under-feeding, the average proportion of volatile acids has decreased, as is shown by the lower Reichert-Wollny number; and, further, that some of the individual specimens now give for this number a value below the lowest limit (24) which has been mentioned as corresponding to normal butter. Meanwhile the refractive index of the fat has become higher, so that the Zeiss number in one instance slightly exceeds, and in two other cases is practically coincident with, the value (43) which has been mentioned as the maximum for normal butter-fat.

In some of the foregoing cases good food would certainly appear at one time to have been very scanty, since it is remarked that in addition to "cotton seed meal, rape-cakes, and bran," the bark of certain species of *Prunus*, *Populus*, and *Betula* had also been used as fodder.

In the case of one dairy, however, the report is that "all the cows are in the stable, and will be turned on pasture during the first days of June. Their health is good; feeding and condition, average." The butter taken from this dairy gave a Reichert-Wollny figure of 28·6, and a Zeiss number 40·1.

Next comes a series of 25 analyses, of which the summarised figures are:—

No. of Samples.	Date of Sampling.	Reichert-Wollny Figures.			Zeiss Numbers.		
		Lowest.	Highest.	Average.	Lowest.	Highest.	Average.
25	16th May to 17th June, 1899.	21·1	32·2	28·1	39·6	43·7	40·9
Some individual samples ...		21·1				43·7	
		21·1				43·7	
		22·0				43·4	
		22·0				43·1	
		23·4				43·5	

Here the average value for the volatile acids is higher than in the last series, and that for the refraction is correspondingly lower. At the same time, the series includes five samples giving what may be called "abnormal" figures. The series, in fact, includes specimens of the products obtained from eight different dairies; and the lesson to be learnt from a perusal of all the details furnished is that the samples of abnormal quality were all derived from farms where the cows, out at pasture, were reported as being in lean condition from under-feeding; and where, too, the weather had been for the most part wet and cold at the period covered by the sampling. On the other hand, where the weather had been warm and dry, or the cows still stabled, and in good condition, the butter was of normal composition. This is, perhaps, best illustrated by the figures and the report for one dairy of each kind:—

I.—Factory giving "abnormal" butter.

Date of Sampling.	Reichert-Wollny Number.	Zeiss Number.
2nd June	22·0	43·1
7th ,,	22·0	43·4
13th ,,	21·1	43·7
17th ,,	21·1	43·7

"Weather cold and partly rainy. Cows at pasture; underfed; condition not good."

II.—Factory giving normal butter.

Date of Sampling.	Reichert-Wollny Number.	Zeiss Number.
16th May	30·9	39·8
29th ,,	30·8	39·9
10th June	30·0	39·9

"Health, feeding, and condition of the cows are good. They are yet in the stable."

For another factory the report was "health very good; feeding and condition average; four-fifths of them are now on pasture; weather warm and dry." The two samples from this dairy gave an average Reichert-Wollny figure of 28·2, and a Zeiss-number 40·4, both samples being of normal composition.

It should, however, be remarked that Dr. Werenskiold subsequently furnished figures showing that some of the factories which had previously yielded "abnormal" butter were still to some extent producing butter of similar character, even when, in the latter part of June, the weather had become warm and dry. Probably the explanation of this is that the cows had

not yet sufficiently recuperated. A little later on the butter from these dairies was yielding normal figures.

If further evidence were required as to the effect of inclement weather and scanty food upon the composition of butter-fat, it would be furnished by a report which has been made to the Royal Agricultural Society of Denmark by Messrs. Boggild and Stein. The report describes some experiments, carefully devised to elucidate the matter, which have been carried out in Denmark with the view of obtaining direct evidence as to some of the causes which may give rise to abnormal butter. The following is a short summary of the experiments and their results :—

Twelve cows, due to calve between the end of November and some time in February, were selected for the trials, which were carried out in 1896 upon the estate of the President of the Society, Count Danneskiold-Samsoe. These twelve cows were divided into four sets of three, the sets being as nearly equal as possible.

Expt. 1.—At first all four sets (I., II., III. and IV.) were out at pasture. As long as this was so (4th to 15th September), the butter yielded by each set was "abnormal"; it had a low proportion of volatile acids and a high refraction number.

Expt. 2.—On 17th September sets I. and II. were stabled. Set I. was fed on cold, wet grass and lucerne; set II. was given a liberal diet of corn, cake, hay, roots, and straw.

The butter from set I. showed a slight improvement, but was still "abnormal." That from set II. had become normal in less than a week.

Of the other two sets, III. was left just as before, but IV., whilst still remaining in the fields, was given from the 17th September a liberal allowance of corn and cake, in addition to the grass.

Neither of these two sets shewed any improvement in the analytical figures of the butter. The better diet in the case of IV. had no effect whilst the cows were still suffering from exposure to cold weather.

Expt. 3.—Sets III. and IV. were then stabled at night only, but turned out during the day. Set III. was given a little corn and cake (2 lb. per head); the diet for IV. was the same as before. Sets I. and II. remained as in Expt. 2.

The butter produced gave in all cases practically the same results as in Expt. 2. Stabling III. and IV. at night alone had no effect; the exposure during the daytime still produced low Reichert-Wollny numbers and high refraction.

Expt. 4.—On the 15th October all the cows were taken into stables and fed liberally on good corn and cake, hay and roots.

Five days later, on 20th October, the butter in all cases gave normal figures, showing the immediate effect of the warm stabling and good dry feeding in increasing the proportion of volatile acids and in reducing the refraction.

The conclusion arrived at is, therefore, that "exposure to cold weather and feeding on cold, wet, poor grass, produces high refraction and low content of volatile acids in the butter-fat.

Better feeding alone, or warmer surroundings alone, has little or no effect; but, combined, they have a marked effect in reducing the refraction and increasing the Reichert-Wollny figure."

Regarding the judicious selection of the foodstuffs, and their effects upon the milk, the Dairy Inspector of Norway, in his report (1894), *Journal of the Board of Agriculture*, vol. I., 1894, page 68, states: "Too small a quantity of artificial feeding stuffs, especially oil cake, is often used in winter, and . . . the milk yields a deficient quantity of butter, poor in fat. Even worse results are said to arise from a one-sided system of feeding with such fodders as brewers' grains, turnips, fish cake and fish meal; these materials can be used with advantage only in small quantities, mixed with large proportions of recognised good artificial foods."

The influence exerted by various foods on the composition of butter has been studied by a number of observers. Appended are summaries of some of the results obtained, together with the authorities responsible for them.

All authorities agree that food exerts a very great influence on the firmness of butter, and that nearly all foods have some influence on its flavour. Green fodder tends to produce butter of low melting-point and comparatively rich in volatile acids; mangold-wurzel also gives butter with a high percentage of volatile acids.

Hay and silage, on the other hand, tend to give butter with a high melting-point (Mayer).

The volatile acids decrease in amount when no cereals are given (Vieth). Oats, decorticated cotton cake, beans and peas are found to be beneficial in their effects on butter, but linseed meal, grains, Paisley meal and foods containing a large proportion of sugar are best discarded, or at least reduced to a minimum (Spier).

Cotton-seed tends to produce a butter of high melting-point, with a consequent diminution in the volatile acids, but with no change in the specific gravity of the fat or its colour (Lupton).

Attempts are occasionally made to influence the amount and nature of the fat in milk by the use of foods containing fat. The testimony as to the value of such foods in augmenting the

amount of milk-fat is conflicting, but the weight of the evidence goes to show that, although in certain cases fat may have an indirect beneficial effect, nevertheless, in the case of a normally fed animal, it has no contributory action on the amounts of the glycerides secreted.

Baumert and Falke have, however, stated that not only is butter-fat greatly changed in character through feeding with various fats, but the alteration is always characteristic of the fats used—that is, the butter-fats produced by feeding cows with sesamé, cocoa-nut or almond oil exhibit on analysis the same characteristics as are found in artificial mixtures of butter-fat with these three oils.

According to Bartlet, gluten food containing much oil produces soft butter, yet when free from fat the gluten will not have the hardening effect of cotton-seed meal; soft butter cannot be attributed to an excess of fat or to a deficiency of nitrogenous food.

Hills tried the effect of adding various oils to food and found that with cotton-seed oil the butter was hard and of good quality; linseed meal rendered it soft and sticky, whereas maize oil made it soft and oily.

In this connection mention may be made of the results of certain feeeding experiments made at the Wye Agricultural College, at the instance of the Board of Agriculture, which are of importance in relation to the search for certain vegetable oils in butter, as indicative of the presence of oleo-margarine. The samples of butter produced by the cows so fed were tested at the Government Laboratory. It was found that :—

1. Cows fed on cotton-seed cake give a butter which shows a reaction for cotton-seed oil.

2. The above is true even when only a small quantity is given, and increases with continuous feeding up to a certain limit which cannot be passed.

3. The reacting substance passes into the milk within 24 hours, and continues several days after the food is stopped.

4. The intensity of the reactions varies with different cows, but does not in any case indicate a greater amount than 1 per cent. of cotton-seed oil in the butter.

5. Feeding on cotton-seed cake gives a butter which, on analysis, shows results tending to diverge still more widely than usual from those yielded by margarine, thus making it easier to distinguish between this and a mixture of margarine and cotton seed oil.

6. Feeding with sesamé cake gives no reaction for sesamé oil in the butter, even after it has been continued for two months.

This last observation is of importance in view of the compulsory use of sesamé oil in the manufacture of margarine in Germany and Belgium. As sesamé oil may be readily detected by comparatively simple tests, the presence of such margarine in butter may be easily recognised.

The flavour of butter, upon which its commercial value so largely depends, is not directly connected with the nature or amount of its constituent glycerides. Flavour would appear to be the result of the action of bacteria, and the extent and character of the flavour would seem to be materially affected by the conditions under which the micro-organisms exist. That the chemical nature of the fats in the milk—that is, the nature and relative proportion of the fatty acids—has little or nothing to do with the flavour, would seem to be proved by the fact that the same cream will yield butters of very different flavour, depending on the manner in which the cream is raised. The butter from separated cream is, as a rule, markedly different in flavour from that made from shallow pan cream.

If butter fat be sealed up and kept in a cold, dark place, it will retain its normal character and appearance for many months, but if kept in a warm locality, with free exposure to air and light, it will very speedily undergo chemical and physical changes and become, as we say, rancid.

According to Browne (J. Amer. Chem. Soc., 1899, 976), by the term "rancidity" is not simply meant, as is generally supposed, a development of free acid—though this is usually an attendant circumstance—but simply oxidation, and in the early stages of the process butter-fat may lose its characteristic colour and smell, and develop an abnormal taste without showing an excessive degree of acidity.

That rancidity in butter is primarily the result of the activity of bacteria is, no doubt, partly true of whole butter, with its lactose, casein, and other constituents to serve as bacterial food, but it is certainly not the case with pure butter-fat, which is unable to support micro-organic life. The independent researches of Duclaux and Rilsert prove that bacteria cannot thrive in a medium of pure fat, and that all changes which take place in fats on keeping are wholly the result of an oxidation, conditioned to a great extent by exposure to light.

The three factors most active in the production of rancidity in butter-fat are air, light, and warmth; and decomposition occurs most rapidly when all three conditions are favourable. In the development of rancidity there are observed, first of all, several changes as regards colour, odour, taste, and general appearance: the sample begins to acquire a lighter colour, the change appearing first on the surface and parts most exposed to light, from which points the action spreads slowly downwards, until finally the whole mass has become bleached. With this loss of colour is noticed also the development of a characteristic so-called "lardy" smell and taste, and as the rancidity becomes greater the smell increases in pungency, whilst the taste, which at first was not markedly acid, becomes exceedingly burning and unpleasant. In addition, there are changes in the consistency of the butter-fat. Originally firm and solid in texture, it assumes a granular appearance, and, after many months, finally turns into a semi-solid, pasty mass.

On determining the various chemical and physical constants of the fat at various stages of its rancidity and comparing them with those obtained when it was in a fresh state, certain characteristic changes are noticed. (Browne, *loc. cit.*) With the development of rancidity we usually observe a decided increase in the amount of free acid, in the saponification and Reichert numbers, as well as in the specific gravity, with a decrease in the insoluble fatty acids and iodine absorption—the latter being of a very marked description. The constituent in butter-fat which is most susceptible to chemical change is oleic acid; this being an unsaturated compound absorbs oxygen with great avidity, yielding either oxy-compounds or decomposing into simpler bodies of lower molecular weight. This instability, and the chemical changes consequent upon it, serve to explain the alterations in the constants mentioned above.

The free acid which soon makes its appearance is due not simply to oleic acid and its decomposition products but to other acids as well. In the development of rancidity there seems to be a gradual breaking up of all the glycerides, the acid part of the molecule spitting off from the glycerol residue, which itself probably undergoes change, and in the case of the complex oleins, the changes which so soon affect the oleic

acid would, no doubt, hasten the disintegration of the entire glyceride.

It is, however, to be noticed that the amount of *free* volatile or soluble acids, in rancid butter-fat is much smaller than might be expected if the explanations of rancidity here brought forward are valid. Why is it that these acids do not appear to any great extent in the free condition? This is probably explained by the fact that the first products formed by the decomposition of oleic acid are not acids but aldehydes: these aldehyde bodies are further changed by oxidation into soluble acids, but this takes place only in an advanced stage of rancidity, which explains a fact frequently noticed, viz., that free soluble acids are not formed to any great extent except in rancid fats of considerable age. By the action of alcoholic potash aldehydes are decomposed into acids and small quantities of dark resinous compounds. This would account for the fact that the soluble acids of decomposition do not appear until after saponification, and would also explain the brown colouration that rancid fats undergo when treated with alkalis. The peculiar odour, as well as the reducing action on silver solutions, are both explained by the presence of bodies of an aldehyde nature in rancid fat.

Other changes which are usually noticed as a butter-fat becomes rancid are the increase of the refractive index, and the lowering of the Crismer number, this lowering being roughly proportional to the acidity.

If bodies of a nitrogenous character be mixed with the butter-fat then rancidity occurs much more quickly, and the decomposition of the glycerides is much accelerated by the aid of micro-organisms, yeasts, and moulds.

T. E. THORPE.

FERTILISERS FOR MARKET GARDEN CROPS.

The object of this article is to give a very short summary of the results of experiments carried out during the last nine or ten years by Mr. Shrivell and myself on the growth of vegetable and fruit crops on a weald clay farm in the neighbourhood of Tonbridge.

The crops under experiment have included various kinds of cabbages, Brussels sprouts, broccoli, cauliflowers, lettuces potatoes, tomatoes, artichokes, beetroots, spinach, carrots, parsnips, celery, onions, leeks, beans, peas, strawberries, gooseberries, currants, plums, raspberries and apples, besides more strictly agricultural crops, such as hops, which latter, however, do not now claim our attention.

Many of the vegetable crops enumerated have been grown every year, but most of our fruit plots have only been established during the later years of our experiments.

In some few cases only two plots are devoted each year to each specific experiment, but in the majority of cases each crop has every year six plots devoted to it. Two of these plots receive town dung only, one getting double the quantity applied to the other; three plots receive the lighter quantity of dung, with varying dressings of chemical fertilisers; while the sixth plot receives an abundant dressing of chemical fertilisers only. The four plots on which chemical fertilisers are applied are sub-divided, one half receiving potash salts, and the other none, So that for nearly all our crops we have, including sub-plots, ten plots every year.

Whenever it is convenient the crops on each section are changed every season, in accordance with ordinary rotation principles.

Accurate notes are kept of all manuring, and the crops are systematically gathered by cutting or pulling them as they are ready for market. For instance, every cauliflower is cut at the

same state of maturity, that is to say, just before it shows indications of "breaking"; and every cabbage is cut individually at what is judged to be its full market size. Each day's produce from each plot, no matter whether it is a single head or a larger quantity, is accurately weighed and the weight entered in a "journal," which is afterwards "posted" into a "ledger," where each plot or sub-plot has its page.

As mere statements of area do not necessarily give very clear ideas of the size of a plantation, it may be mentioned that our six plots of cauliflowers last year contained in all 1,296 plants; that our six plots of autumn cabbages contained in all 2,304 plants; and that our six plots of winter lettuces contained in all 3,024 plants. Altogether, we have at present under cultivation about 300 plots and sub-plots, the produce of each of which is separately gathered and weighed.

It may be added that all the plots are separated by paths, in order to retain the individuality of each plot, and that all cultivation is carried out by spade labour.

From what has been said as to the disposition of the plots in each of our sections, it will be gathered that the general scheme of our experiments is to compare, for each crop, the relative utility of town dung used by itself in either light or heavy dressings, and used in conjunction with concentrated fertilisers; and at the same time to ascertain whether, and for what crops, dung may be sometimes economically dispensed with altogether.

Market gardeners necessarily spend on manure much larger sums than ordinary farmers. Many of their crops are heavier and make more urgent demands on the soil than do those of the farmer; and, furthermore, they must be grown as rapidly as possible. The manure on which market gardeners spend most money is town dung. Concentrated fertilisers are also used to a considerable and, of late years, increasing extent in our market gardens, but a great many growers still pin their faith wholly to town dung. Town dung is very commonly used by the market gardener in quantities of 25 tons per acre; often he puts on as much as 50 tons per acre in one dressing. The cost of this dung is variable according to the locality of the farm, but, on an average, when all charges are paid, it probably costs quite 7s. per ton in the field,

and in many cases considerably more. At our farm, a few miles from Tonbridge, it actually costs 8s. per ton, including cartage. Such heavy dressings as have been mentioned are, therefore, very costly. Town dung, moreover, is poor in quality as compared with farmyard dung. Probably its principal practical value consists in the organic matter it contains, which, in the case of light and sandy soils, is a great desideratum in dry weather for the purpose of retaining moisture in the soil; while in the case of stiff clays—like our own soil—it also tends to prevent baking and to keep the soil open and spongy. It seems probable that, except on extremely light and open soils, the mere mechanical and physical good effects might be obtained by using very much smaller quantities of town dung than are commonly used, while it appears to be clear, from the results of our experiments, that, for most vegetable crops, such dung, regarded merely as an actual source of plant food, is quite inadequate for the purpose of maximum production unless we use very large quantities. Even then the cost of the dung is very much greater than would suffice to produce the same result if a much smaller quantity of dung were used, supplemented by chemical or concentrated fertilisers.

The concentrated fertilisers we have used are superphosphate —varied occasionally by basic slag—nitrate of soda, and sulphate of potash (or occasionally kainit). To avoid repetition, it may be taken that, in the following pages:—

"*Light Dung*" means 12½ tons, or 25 small cart-loads, of London dung per acre;

"*Heavy Dung*" means 25 tons, or 50 small cart-loads, of London dung per acre;

"*Phosphates*" means an annual dressing of about 4 to 6 cwt. of superphosphate (or its equivalent of basic slag) per acre;

"*Potash*" means 1 cwt. of sulphate of potash (or 4 cwt. of kainit) per acre.

The nitrogenous manure used throughout has been nitrate of soda. The necessarily large number of our plots has rendered it quite impracticable to complicate our work by any comparison between this and other well-known nitrogenous fertilisers, such

as sulphate of ammonia, fish guano, dried blood, rape dust, &c. The choice of nitrogenous fertilisers is one to be determined by circumstances of soil, climate and cost, and it is quite likely that many of the good results obtained with nitrate of soda might, under suitable circumstances, be yielded by some of the other nitrogenous fertilisers referred to.

It should be observed that our work has been carried on during an exceptionally dry cycle of years. On this account dung has had the best possible chance to exhibit its physical advantages over concentrated chemical fertilisers; but it has probably been placed at somewhat of a disadvantage as a source of nitrogenous plant food, since organic matter requires abundant moisture in order to undergo ready nitrification. Nitrate of soda, on the other hand, is in a better position than dung, or perhaps any other manure, to do itself full credit in dry weather, since a very moderate shower places it in a state of full activity. At the same time, wet weather tends to produce abundant growth, demanding an abundance of readily assimilable food; and it is not easy to guess whether, on the whole, wet or dry weather would diminish or intensify the differences which we have consistently found between the results of heavy dunging on the one hand and of light dunging supplemented by chemical fertilisers on the other. Possibly we may get a cycle of wet years, which, as we hope to continue our experiments, may throw light on this point.

In the following notes are given some of the most illustrative of the results of our experiments, together with such general practical recommendations for each crop as the experience of Mr. Shrivell and myself thus far leads us to make.

Cauliflowers (Autumn).

On an average of eight consecutive crops we obtained the results shown in the table on page 465.

Chemical fertilisers alone, without dung, were much more productive than even heavy dung without them, but less satisfactory than in their combination with light dung.

We recommend for cauliflowers a light dressing of town dung (about 12 tons per acre), with from 4 to 6 cwt. of superphos-

phate, 4 cwt. of kainit, and 4 cwt. of nitrate of soda per acre. But if dung is short, a good crop may be secured by using 6 cwt.

Annual Manuring.	Average Annual Weight of Cauliflowers per acre.		Annual Cost of Manure per acre.		
	Tons	Cwt.	£	s.	d.
Light Dung	13	5	5	0	0
Heavy Dung	16	3	10	0	0
Light Dung and Phosphates, Potash, and 4 cwt. Nitrate of Soda per acre	19	2	8	5	0

of superphosphate, 4 cwt. of kainit, and from 6 to 8 cwt. of nitrate of soda per acre. Of the last-named fertiliser half the quantity should be applied when the plants are well established and half later.

Broccoli.

Over eight years our experiments with this crop have yielded the following average results :—

Annual Manuring.	Average Annual Weight of Broccoli per acre.		Average Annual Cost of Manure per acre.		
	Tons	Cwt.	£	s.	d.
Light Dung	11	8	5	0	0
Heavy Dung	12	16	10	0	0
Light Dung and Phosphates and 4 cwt. Nitrate of Soda per acre...	14	2	7	15	0
No Dung, but Phosphates, Potash and Nitrate of Soda (4 cwt. per acre during first 5 years, 8 cwt. per acre during last 3 years) ...	13	3	4	0	0

Our general recommendations as to manuring would be the same for broccoli as for cauliflowers.

Autumn or Main Crop Cabbages.

We have recorded eight crops of autumn cabbages. The dressings of nitrate of soda applied with the other manures have varied from 1 cwt. up to 6 cwt. per acre with dung, and from 4 cwt. to 8 cwt. per acre without dung. The results of the

first five crops, grown with the lighter dressings, accord closely with those of the last three, so that, for simplicity's sake, I give in the following table only the average results of the last three :—

Annual Manuring	Average Annual Weight of Cabbage per acre.		Annual Cost of Manure per acre.		
	Tons	Cwt.	£	s.	d.
Light Dung	20	6	5	0	0
Heavy Dung...	24	3	10	0	0
Light Dung and Phosphates and 4 cwt. Nitrate of Soda per acre...	24	9	7	15	0
Light Dung and Phosphates and 6 cwt. Nitrate of Soda per acre	27	17	8	15	0
No Dung, but Phosphates and 8 cwt. Nitrate of Soda per acre ...	24	14	4	15	0
No Dung, but Phosphates, Potash and 8 cwt. Nitrate of Soda per acre...	25	18	5	5	0

We consider that probably the best general mode of manuring is to apply a light dressing of town dung (not more than about 12 tons per acre) supplemented by a dressing of 6 cwt. of superphosphate and from 4 cwt. to 6 cwt. of nitrate of soda per acre, one-half of the nitrate being applied at planting out and the remainder a month or two later. If dung cannot be spared, as much as 8 cwt. of nitrate of soda per acre may be used, and in this case it might be well also to give a dressing of potash salts. Where dung is used, however, we do not find that potash salts are of much, if any, use for this crop.

Savoy Cabbages.

The average results that we have obtained from nine crops of savoys are shown in the following table.

Chemical fertilisers without dung give better results than the heavy dressing of dung without them, but not such good results as were obtained by combining the two. Probably the best manuring for savoys is a light dressing of dung, from 4 to 6 cwt. of superphosphate, and 4 cwt. of nitrate of soda per acre.

During the last three years we have also tried dressings of 6 cwt. of nitrate of soda per acre, but the increase has scarcely

been commensurate with the extra outlay. In case dung cannot be spared, however, and the grower is relying upon chemical

Annual Manuring.	Average Annual Weight of Savoys per acre.		Annual Cost of Manure per acre.		
	Tons	Cwt.	£	s.	d.
Light Dung	13	3	5	0	0
Heavy Dung...	15	19	10	0	0
Light Dung, Phosphates and 4 cwt. Nitrate of Soda per acre ...	18	5	7	15	0

fertilisers alone, he should use at least 6 cwt. of nitrate of soda per acre.

We have occasionally found potash salts to be of use for this crop, but as a rule we consider that, on land in good cultivation and occasionally dressed with potash salts for other crops, no special application of them need be made for savoys.

Spring Cabbages.

This crop is usually planted on freshly dunged land in the autumn and gathered in the spring. As we are revolutionary

Annual Manuring.	Average Annual Weight of Cabbages per acre.				Annual Cost of Manure per acre.		
	5 crops (1895-99).		2 crops (1900 and 1901).				
	Tons	Cwt.	Tons	Cwt.	£	s.	d.
Light Dung	15	12	19	17	5	0	0
Heavy Dung	16	2	21	0	10	0	0
Light Dung, and Phosphates, Potash, and 4 cwt. Nitrate of Soda per acre	18	0	21	3	8	5	0
No Dung; but Phosphates, Potash, and 4 cwt. Nitrate of Soda per acre	17	14	—		3	5	0
No Dung; but Phosphates, Potash, and 8 cwt. Nitrate of Soda per acre	—		20	17	5	5	0

enough to propose that any special application of dung may be dispensed with altogether for this crop, I give figures above

illustrative of our results for the first five crops and for the last two crops recorded.

It will be seen that heavy dunging did very little more good for this crop than light dunging, and that by far the most economical yield was obtained by dispensing with dung altogether.

It must be remembered that this crop is planted out after the summer heat is over, and that it is not subject to the perils of drought like spring-planted crops. Probably the less forcing the manure that it receives before the winter the better, as the greater its autumn development the more liable it is to be attacked by frost.

We recommend that spring cabbages should be planted without further dung than the residue left from the dung applied to the previous crop, and that, at the time of planting, a liberal dressing of superphosphate or other phosphatic manure be given, with 4 cwt. of kainit or 1 cwt. of sulphate of potash per acre. Nitrate of soda at the rate of from 4 cwt. to 8 cwt. per acre may be applied during the spring, the application being divided into two or more dressings according to the soil and season.

Red or Pickling Cabbages.

We made a small experiment last year to test the effect of nitrogenous manure on this crop, with the following results :—

Manure per acre.	Weight of Cabbages per acre.		Cost of Manure per acre.		
	Tons	Cwt.	£	s.	d.
Light Dung, Phosphates and Potash Salts	13	19	6	5	0
Ditto, ditto, with, in addition, 4 cwt. Nitrate of Soda per acre...	20	9	8	5	0

Brussels Sprouts.

This is another crop which our experience leads us to conclude may be most economically grown without any direct application of dung, except perhaps on the very lightest soils. The results given in the following table are those of our first five crops. Those of the last three years are closely confirmatory, but, as

the dressings have been varied, they are not easy to take into the average.

The results are given in "sieves" of 40 lb. weight.

In this case, as the crop is one easy to value, I give, as well as the cost of the manure, the value of the sprouts, taken at what is probably a fair average price, namely, 1s. 6d. per "sieve."

Annual Manuring.	Average Yield of Sprouts per acre (first 5 years).	Annual cost of Manure per acre.			Value of Sprouts per acre at 1s. 6d. per "sieve."			Value of Sprouts per acre after deducting cost of Manure.		
	"Sieves."	£	s.	d.	£	s.	d.	£	s.	d.
Light Dung	244	5	0	0	18	6	0	13	6	0
Heavy Dung	279	10	0	0	20	18	0	10	18	0
Light Dung and Phosphates, Potash and 2 cwt. Nitrate of Soda per acre	306	7	5	0	22	19	0	15	14	0
Light Dung and Phosphates, Potash and 4 cwt. Nitrate of Soda per acre	318	8	5	0	23	17	0	15	12	0
No Dung; but Phosphates, Potash and 4 cwt. Nitrate of Soda per acre	292	3	5	0	21	18	0	18	13	0

As has been said, the experience of the last three years is quite confirmatory of these results, which scarcely call for comment, as they explain themselves.

It may, however, be pointed out that the wonderfully good crops of sprouts grown without dung are grown on a plot of land that has been not merely undunged for this crop, but persistently undunged for any crop year after year. If we have regard to the fact that every field in a market garden will, under any system of cultivation, be at least intermittently dunged, the extravagance of dunging specially for sprouts becomes further accentuated.

Winter Lettuces.

These we have grown without any special application of dung on plots which had been dunged for the preceding crop. The results indicate that, if the grower has been so extravagant as to use anything like 25 tons of dung per acre for the previous crop, he may safely plant winter lettuces on the same land without

any further manuring, and will probably get the largest crop that soil and season will allow, or, at any rate, a crop not very far short of that. Unless, however, he has been guilty of such extravagance, it would be better to plant winter lettuces after a crop that has been moderately dunged, and to use a dressing of about 4 cwt. of superphosphate and 2 cwt. of nitrate of soda per acre.

Summer Lettuces.

Summer lettuces, however, should not be left without dung, as they have to live through possible drought in a critical time of the year; though, if the season should happen to be favourable, they will thrive well enough without it, provided they be abundantly fed with other manures. On the whole, a light dressing of dung, from 4 cwt. to 6 cwt. of superphosphate, and 2 cwt. of nitrate of soda per acre, will form a good dressing, and our results appear to indicate that, on most soils, no special application of potash salts need be made for this crop.

Globe (or Thistle-headed) Artichokes.

The following table shows the average results of five years' crops from the same plantation of artichokes :—

Annual Manuring.	Average Annual Number of Total Heads per acre.	Average Annual Number of "Early" Heads per acre.
Light Dung	12,170	6,240
Heavy Dung...	17,440	9,830
Average of 3 plots receiving annually Light Dung and Phosphates, Potash Salts, and Nitrate of Soda, the last-named in quantities varying from 1 cwt. to 6 cwt. per acre	17,993	10,870
Average of 3 plots manured as above but without Potash Salts	15,666	8,620

It will be seen that the combination of chemical fertilisers and light dung has given much better results than heavy dunging.

The effect of potash salts on this crop is very remarkable. The plots liberally manured with chemical fertilisers but without

dung did not do much better than the lightly dunged plot, and not nearly so well as the plots on which dung and chemical fertilisers were combined.

Probably the best dressing for this crop is a light quantity of dung, 6 cwt. of superphosphate, at least 1 cwt. of sulphate of potash (or 4 cwt. of kainit), and from 2 cwt. to 4 cwt. of nitrate of soda per acre.

We find that the mode of manuring very greatly affects the value of this crop, not so much on account of the influence of the manure on the total number of heads grown as on account of its influence on the earliness of the crop. There is very little demand for globe artichokes after the close of the London season. Heads grown in the early part of the season are readily marketable, while those grown after about July are not worth the expense of sending to market. Such, at all events, is the experience of those who cater for London.

Jerusalem Artichokes.

On the whole, our experience with this crop indicates, as in the case of winter lettuces, that if a grower has been so extravagant as to use as much as 50 loads of town dung per acre for the preceding crop, Jerusalem artichokes may most profitably follow that crop without any additional manuring; but if only a moderate dressing of dung has been applied to the preceding crop, they may be most satisfactorily planted without any additional dung, but with a dressing of superphosphate and 1 cwt. of sulphate of potash per acre, and top-dressed with 2 cwt. of nitrate of soda per acre.

Carrots and Parsnips.

Carrots and parsnips are usually grown on the residue of dung applied for a previous crop. The following table gives extracts from our records relating to these crops.

Here, again, if the grower has used on any of his fields as much as 25 tons of town dung per acre for a previous crop, it will probably pay him better to plant his carrots or parsnips in such a field than to manure them specially. But presuming that he has manured the previous crop with a moderate quantity only of dung, then he had better plant his carrots or parsnips after

treating the ground with 4 cwt. to 6 cwt. of superphosphate and 1 cwt. of sulphate of potash per acre. Potash salts should on no account be omitted, as it has been evident year after year from our experiments, as is well shown in the averages, that the influence of potash on these crops is very great.

Annual Manuring.	Average Annual Weight of Crop per acre.				Annual Cost of Manure per acre.		
	Carrots (6 years).		Parsnips (7 years).				
	Tons	cwt.	Tons	cwt.	£	s.	d.
Light Dung (applied to previous crop)	12	15	9	1		nil	
Heavy Dung (applied to previous crop)	15	2	11	4		nil	
Light Dung (to previous crop); carrots dressed with Phosphates (no Potash) and 2 cwt. Nitrate of Soda per acre	13	8	10	2	1	15	0
Ditto, ditto (with Potash)	15	14	11	1	2	5	0
Light Dung (to previous crop); carrots dressed with Phosphates (no Potash) and 4 cwt. Nitrate of Soda per acre	14	11	9	9	2	15	0
Ditto, ditto (with Potash)	16	2	11	0	3	5	0

After the plant is well up, it may be top-dressed with 2 cwt. of nitrate of soda per acre; and in the case of carrots, this top-dressing may sometimes be advantageously repeated a month later. One dressing of 2 cwt. of nitrate of soda per acre appears, however, according to our experience, to be sufficient for parsnips.

Celery.

We have found it difficult in most seasons to grow good crops of celery in our stiff soil without the use of a large quantity of dung in the trenches, and we have found that supplementing the dung with chemical fertilisers does not materially affect the weight of our crop, though it seems to improve the rapidity of growth and to make the celery more crisp and tender than that grown by the use of dung alone.

Spinach.

Our last three crops of summer spinach averaged only $4\frac{3}{4}$ tons per acre when a light dressing of dung was used, and less than $6\frac{1}{2}$

tons per acre when a heavy dressing of dung was used. By supplementing the light dressing of dung, however, with phosphates and nitrate of soda, the crop was increased to $7\frac{3}{4}$ tons per acre when 2 cwt. of nitrate per acre were applied, to $8\frac{3}{4}$ tons when 4 cwt. of nitrate were applied, and to 9 tons when 6 cwt. of nitrate were applied.

Potash had very little effect upon the crop except when dung was omitted altogether.

Winter spinach was grown in two years after the removal of the summer spinach without extra manure. The best crops were obtained from the plots yielding the best crops of summer spinach. The difference between the yield of the lightly-dunged plot and that of the best chemical plot in 1898 was about $5\frac{1}{2}$ tons of winter spinach per acre, and in 1901 nearly $8\frac{1}{2}$ tons per acre. Probably at least 50 tons of dung per acre would have been necessary to yield anything like these results.

Beetroots.

This crop, during the dry seasons we have gone through, has been a good deal affected by drought. Possibly for this reason the heavily dunged plot has done nearly as well as any of the plots on which a light dressing of dung has been supplemented by chemical fertilisers, but the expense of the heavy dung necessary to obtain this result has been considerably greater than the expense of manuring with a light dressing of dung combined with chemical fertilisers.

Our general suggestion for the manuring of beetroots would be the use of a light dressing of town dung, from 4 cwt. to 6 cwt. of superphosphate, and 4 cwt. of nitrate of soda per acre, 2 cwt. of the nitrate being applied shortly after the plant is up, and a further 2 cwt. per acre as a top-dressing a month or so afterwards. If, however, the crop is not grown with dung, it would be well to give also 4 cwt. of kainit (or 1 cwt. of sulphate of potash) per acre, sown some time before the preparation of the seed bed, and in this case a third top-dressing of nitrate of soda may be given. According to our experience, potash will not generally be found necessary where dung is directly applied.

Rhubarb.

The most interesting plots of our rhubarb plantation have given the following average results over four years.

In the case of the small varieties, doubling the dung gave a very large increase, but practically the same result was obtained by supplementing the light dressing of dung with a moderate dressing of chemical fertilisers.

In the case of the coarse variety heavy dunging again largely

Annual Manuring.	Small or Fine Varieties.		Large or Coarse Variety.		Annual Cost of Manure per acre.		
	Number of Sticks pulled per acre.	Total Weight per acre.	Number of Sticks pulled per acre.	Total Weight per acre.			
		Tons Cwt.		Tons Cwt.	£	s.	d.
Light Dung	61,900	12 8	70,440	27 0	5	0	0
Heavy Dung	105,875	19 9	97,310	38 15	10	0	0
Light Dung, and Phosphates, Potash and 2 cwt. Nitrate of Soda per acre...	101,430	19 3	99,500	37 12	7	5	0
Light Dung, and Phosphates, Potash and 4 cwt. Nitrate of Soda per acre...	93,950	19 9	96,050	40 16	8	5	0
No Dung; but Phosphates, Potash and 4 cwt. Nitrate of Soda per acre ...	79,800	12 17	94,640	37 0	3	5	0

increased the crop, but a better and cheaper result was obtained by combination of light dung and chemical fertilisers. In fact, with the coarse variety, chemical fertilisers alone, at a comparatively small cost, did nearly as well as even the heavy dressing of dung.

With both kinds of rhubarb we have noticed, by examination both in the kitchen and on the table, that the leaf-stalks produced on the plots receiving chemical fertilisers were, owing probably to more rapid growth, much more tender and less stringy than those grown with dung alone.

Our experience leads us to suggest that the most satisfactory results with rhubarb may be obtained with a light dressing of dung, a dressing of from 4 cwt. to 6 cwt. of superphosphate and 2 cwt. of nitrate of soda per acre for small varieties, or 4 cwt. of nitrate of soda per acre for large varieties.

Our small varieties have benefited from the application of potash salts, but not the large variety. A suitable dressing of potash salts is 1 cwt. of sulphate of potash, or 4 cwt. of kainit, per acre.

Potatoes.

The average results are shown in the following table :—

Annual Manuring.	Early Varieties (7 crops). Weight of Potatoes per acre.		Late Varieties (8 crops). Weight of Potatoes per acre.		Average Annual Cost of Manure per acre.		
	Tons	Cwt.	Tons	Cwt.	£	s.	d.
Light Dung	5	14	8	15	5	0	0
Heavy Dung	7	7	10	6	10	0	0
Light Dung, Phosphates (no Potash) and 2 cwt. Nitrate of Soda per acre	6	4	9	13	6	15	0
Ditto, ditto (with Potash)	6	9	10	9	7	5	0
Light Dung, Phosphates (no Potash) and 4 cwt. Nitrate of Soda per acre	6	7	10	5	7	15	0
Ditto, ditto (with Potash)	6	10	11	3	8	5	0
No Dung; but Phosphates (no Potash) and *4 cwt. Nitrate of Soda per acre	3	6	5	8	3	5	0
Ditto, ditto (with Potash)	4	10	8	0	3	15	0

* 8 cwt. Nitrate of Soda per acre in 1900 and 1901.

We have grown seven crops of early varieties, and our experience tends to show that, in such dry weather as we have had and on such a soil as ours, a heavy dressing of 25 tons of dung per acre is more economical than a lighter dressing, even when the latter is very liberally supplemented by chemical fertilisers. We have not, however, tried how far the yield of the heavy dressing of dung might be further improved by the additional use of chemical fertilisers.

We attribute the excellence of the results obtained by heavy dunging in this case mainly to its effects in the direction of conserving moisture.

With late varieties we have obtained the best results by using light dung combined with chemical fertilisers.

The early varieties were "Windsor Castle," or "White Beauty," while the main crop varieties were "Beauty of Hebron," "Magnum Bonum," "Imperator" and "Up-to-date."

It will be seen that potash has produced very little effect in the case of the early potatoes, while its effect has been very marked on the late varieties.

It is interesting to notice that, although in two seasons we have used, where no dung was applied, as much as 8 cwt. of nitrate of soda per acre, this large quantity of nitrogenous manure produced no prejudicial effect upon the quality of the potatoes; but, until we have larger experience, we should not advise the use of more than 4 cwt. of nitrate of soda per acre.

Spring (or Summer) Onions.

With spring or summer onions our experience is limited, for in several years the plant has practically failed owing to drought or wireworm. In two seasons we grew crops up to 10 or 11 tons per acre of marketable onions, and, strangely enough, on the average of these two years, heavy dung gave little advantage over light dung, the best results in both years being

Annual Manuring.	Weight of Onions per acre.				Annual Cost of Manure per acre.		
	1900.		1901.				
	Tons	Cwt.	Tons	Cwt.	£	s.	d.
Light Dung	7	0	11	11	5	0	0
Heavy Dung	8	11	10	7	10	0	0
Light Dung, Phosphates, Potash and 2 cwt. Nitrate of Soda per acre ...	8	16	11	16	7	5	0
Light Dung, Phosphates, Potash and 4 cwt. Nitrate of Soda per acre ...	9	10	8	14	8	5	0
Light Dung, Phosphates, Potash and 6 cwt. Nitrate of Soda per acre ...	10	0	11	8	9	5	0

obtained by the use of light dung combined with phosphates, potash salts and nitrate of soda. Our results for these two years are shown in the preceding table

Potash salts produced throughout a very decided effect. Indeed, on the plots (not above quoted) on which no dung was used, the half-plots receiving potash salts averaged about double the yield of the half-plots from which potash salts were withheld.

Our experience with spring onions is too limited for any more specific suggestions than indicate themselves in our results.

Tripoli Onions.

We have been more successful with Tripoli onions. The following are some of our results over five years :—

Annual Manuring.	Average Annual Weight of Onions per acre (excluding unsound or unmarketable bulbs).		Annual Cost of Manure per acre.		
	Ton	Cwt.	£	s.	d.
Light Dung	7	16	5	0	0
Heavy Dung...	10	10	10	0	0
Light Dung and Phosphates, Potash and 2 cwt. Nitrate of Soda per acre	11	7	7	5	0

It may be added that comparison between the potash and non-potash plots shows that potash salts are an important constituent of the fertilisers to be used for Tripoli onions. This was strikingly shown on one of our undunged plots in a recent season. The plot was manured with 6 cwt. of superphosphate and 8 cwt. of nitrate of soda per acre, one half of the plot receiving sulphate of potash at the rate of 1 cwt. per acre, the other half being kept without potash salts. On the latter half-plot the plant entirely failed, and there were no onions at all to gather, whereas on the potash half we had 10 tons per acre of onions, all of which were sound and marketable.

Generally speaking, we should recommend for this crop a light dressing of dung, with superphosphate and a dressing of nitrate of soda. The quantity of nitrate of soda used should

be not less than 2 cwt. per acre. Whether an additional 2 cwt. would produce benefit or not is probably a matter of season.

Asparagus.

We made a plantation of asparagus in a very unpromising clay field. The land was first thoroughly well trenched, and a good deal of dung was uniformly distributed in the subsoil before the replacement of the surface soil. The plots were manured according to the general plan adopted with our other vegetables.

There has never been any substantial advantage shown by the heavily dunged plot over the lightly dunged plot. During the first three seasons the size and weight of the asparagus grown was about the same on both the dunged plots. The shoots were, however, much finer and heavier on the plots on which the dung was supplemented by phosphates, potash salts, and nitrate of soda, especially on the plots where the quantity of nitrate used was from 2 to 4 cwt. per acre. Even the plot without dung, but manured liberally with chemical fertilisers, gave much finer asparagus than the heavily dunged plot, though the actual yield was less.

During the succeeding three years the difference between the various plots has disappeared, as far as size and yield are concerned, and we are growing asparagus all round at the rate of nearly 3,000 bundles per acre (a "bundle" being 50 shoots). Possibly the indifference to surface manuring is because our plants are now feeding in the residue of the dung buried in the retentive subsoil. The crop, however, is earlier on the chemically fertilised plots than on the "dung-only" plots, and the asparagus is more tender and succulent and of better flavour than where dung only is used.

Beans and Peas.

Leguminous crops are now frequently supposed to be non-responsive to nitrogenous manure, because, under certain circumstances, they are able to flourish independently of it. The remarkable results produced by nitrate of soda and sulphate of ammonia on lucerne at Woburn, and the no less striking results obtained in our own experiments on lucerne—which have been fully published and discussed elsewhere—have led Mr. Shrivell

and myself to try some experiments with nitrogenous manure on ordinary garden beans and peas.

Dwarf French Beans.

Our experiments with these have now extended over three years. The results are shown in the following table :—

Annual Manuring.	Weight per acre of Green Beans as picked for Market.							
	1900.		1901.		1902.		Average.	
	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.
Light Dung, Phosphates and Potash Salts (without Nitrate of Soda)	2	13	2	17¼	3	17	3	2½
Light Dung, Phosphates and Potash Salts, with 2 cwt. Nitrate of Soda per acre ...	4	6	3	15¼	5	10	4	10½

It will be seen that in every year a substantial advantage was gained by the use of 2 cwt. of nitrate of soda per acre.

Scarlet Runners.

We tried last year a similar experiment with scarlet runners, but in this case no appreciable effect was produced by the nitrogenous manure.

Green Peas.

This also has been practically the case, as regards mere yield, with green peas. Our results with these were as follow :—

Annual Manuring.	Weight per acre of Green Peas in pod.							
	1900.		1901.		1902.		Average.	
	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.	Tons	Cwt.
Light Dung, Phosphates and Potash Salts (without Nitrate of Soda)	2	16	1	3¼	4	2	2	13¾
Light Dung, Phosphates and Potash Salts, with 2 cwt. Nitrate of Soda per acre ...	2	14	1	8	4	2½	2	14¾

The peas, however, grown with nitrate of soda appear to form more quickly, and careful observation last season showed that their colour, texture and taste were much better than those of the peas which received no nitrogenous manure.

Gooseberries.

We have thus far only gathered three crops from a plantation which we laid down in 1898. The results may be summarised by stating that, while the heavy dressing of dung has, on the average, done much better than the light dressing, its yield has been altogether surpassed by that of the plot manured with light dung, phosphates, potash salts and 4 cwt. of nitrate of soda per acre.

While the non-potash half-plots, over three years, have given an average yield of 817 lb. of fruit per acre, the potash half-plots have averaged 1,411 lb., and this difference has been consistently observed in the case of every plot throughout the three years.

The yield of the plots receiving, with dung, phosphates and potash salts, only 1 cwt. or 2 cwt. of nitrate of soda per acre, has fallen far short of that of the plots receiving nitrate of soda at the rate of 4 cwt. per acre.

Currants, Plums, Raspberries, and Apples.

Our plantations are too immature yet to enable any general conclusions to be formed from their results.

Strawberries.

We have recorded six crops of "Paxton" strawberries, four crops of "President," and two crops of "Royal Sovereign." The manures have been applied on the same scheme as on most of our other plots.

Generally speaking, the influence of manure on the actual weight of fruit grown has been insignificant compared with the effects produced on most of our other crops; but the addition of chemical fertilisers to the light dressing of dung has had the effect of making the crop earlier. As an example of this, it may be mentioned that in one strawberry season of great abundance we gathered 4 tons 4 cwt. of strawberries per acre from the lightly dunged plot, while from the plot on which a light dressing of dung was supplemented by phosphates and 2 cwt. of nitrate of soda per acre we gathered 4 tons 7 cwt. per acre—a very slight difference on so large a crop. But, during the first few days of picking, the latter plot yielded nearly 700 lb. more fruit per acre than the former, and during this time the market value of the strawberries per pound was at least twice that of the fruit picked during the succeeding days. This is a matter of very vital importance to the grower.

The combination of dung and chemical fertilisers here mentioned is the one which we should generally recommend for strawberries. Potash salts, as far as our experience goes, appear to have been deleterious rather than beneficial to strawberries.

Kentish Cob-nuts and Damsons.

We have for a number of years had under experiment a nut and damson plantation on the fruit farm of our friend and neighbour, Mr. Godwin, of East Peckham. Here the comparison is not between dung and chemical fertilisers, but between the latter and wool waste, which is the favourite local manure for these fruits.

The best results have been yielded by a dressing of phosphates, potash salts and 2 cwt. of nitrate of soda per acre, but the difference in yield on the various plots has not been great. The price obtained for the nuts from the chemically manured plots, however, has been uniformly greater than that realised by the wool-waste-manured nuts, on account of the more luxuriant development in the former case of the "beard" or cupule, which for some real or imaginary reason affects very decidedly the market value of Kentish cob-nuts.

The damson results have been very irregular, owing to vicissitudes of season. In a good season far better results have been obtained on the plots manured with phosphates, potash salts and nitrate of soda, at the rate of from 2 cwt. to 4 cwt. per acre, than on those left unmanured or manured with wool waste only, or than on those manured only with phosphates and potash salts without nitrogen.

Superphosphate has been throughout recommended as a phosphatic dressing. This is always on the assumption that the soil to be manured contains an appreciable quantity of lime—that is to say, sufficient carbonate of lime to cause effervescence when a mineral acid is poured upon it. On land poor in lime I should recommend, in substitution of superphosphate, either basic slag, Peruvian guano, fine bone meal, a mixture of superphosphate with bone meal, or the superphosphate neutralised with lime which is now obtainable under the name of "basic superphosphate"; or that, at any rate, the use of one or other of these manures should be alternated every other year with that of superphosphate.

BERNARD DYER.

POTATO GROWING.

The cultivation of the potato as a farm crop in Great Britain exceeds half a million acres yearly, and has done so every year for more than a quarter of a century. What the area grown in gardens amounts to is difficult to estimate; but in aggregate it must be many thousand acres. The Agricultural Returns for Ireland show a greater area than for the rest of the kingdom. When much more than a million acres are put under this crop yearly, one cannot but be surprised at the small amount of literature there is on the subject, and how little space is devoted to it in newspapers dealing with croppings.

No crop occupying as much as 100,000 acres yearly gives so large a return per acre; at the same time, it is more expensive to produce than is any other crop occupying that area. We do not recommend an extension of the area, because if this were done on a considerable scale a large portion of the crop would not be profitable. A smaller acreage well done would meet the market requirements. There is room, however, for more potatoes of good quality. There can be little doubt but that no small proportion of the potatoes grown fail to give a profit except in seasons when, through various causes, the price is above average. The chance of occasionally making a fortunate hit, although they may lose in other years, induces many who possess little skill to grow potatoes. On the other hand, there are those who, with soil suitable, skill in selecting varieties, and good management, invariably make substantial profits. Among potato growers there are many of the most skilled cultivators, the shrewdest men of business, with the best advanced views and methods of those connected with British farming. The influence of these has not been without effect, and, undoubtedly, there is less haphazard growing than prevailed comparatively few years ago. Their methods of cultivation have been copied; and they have been pioneers in making the repute

of new varieties, which have enabled ordinary growers to change from worn-out and unprofitable kinds to new and vigorous ones. Their example has been much needed, because there has been little reliable information to be obtained from other sources.

This point of selection of suitable varieties is of first importance. To be profitable a variety must be a heavy cropper, not too delicate for field cultivation (for many varieties admirably suited to the gentle nurturing of garden work fail to be profitable in the field), not succumbing easily to disease, not wasteful in preparation for cooking, cook well (that is, evenly throughout), and be suitable in flavour and colour to the demands of the best markets. A variety may start its career with a high standard in all the above features, but in course of years one or all of these features deteriorate, so that it is no longer profitable to grow. There are occasional instances where potatoes improve after being in cultivation a few years ; this is most often the case where the variety has shown excessive vigour, and has developed too large tubers during the early portion of that period. Tubers beyond a certain size are regarded as being too coarse for the best trade, and in that case they fetch but moderate prices from the baker to use in bread making and from the itinerant baked-potato merchant. It is, however, preferable that a variety should err on the side of coarseness rather than in want of size in its early career. No further illustration of the folly of growing a variety which has passed its prime need be looked for than the persistency of Irish growers in still adhering to the worn-out "Champion." To this is mainly due the recurrence of potato famines. Before the Champion came out they adhered to other worn-out varieties.

The deterioration of all varieties renders it imperative that new varieties be introduced. The production of a new variety is simple. The seeds contained in the fruit or apple if sown will, if properly matured, grow, and each plant so produced represents a new variety ; but only a few out of many thousands will be worth development. Even when skilful mating is performed, the ratio of plants worth developing is exceedingly small, though judicious mating raises the ratio, and ensures some characteristics of the parents being incorporated. As a rule, however, the varieties which prove most valuable are those which

awake latent features not necessarily apparent in the parents. These plants, the result of cross-breeding, possess special vigour. The value of a new variety lies greatly in the invigoration which evolves from the mating of stocks distantly related, thus avoiding the enfeeblement which arises from too close in-and-in breeding, whether in plants or animals. Except for producing new varieties the seed is not sown, the ordinary sets being, of course, tubers, which are collections of buds conveniently associated with a reserve of plant food to support them when they awake from their dormant condition in the following spring. A great many new varieties fall short in only one feature, which is, however, sufficient to prevent their introduction, or, if introduced, causes them to be discarded very soon. It is because so few are good at all points that a really good new variety is eagerly sought after, and is rapidly developed, so that in a few years it is grown by tens of thousands, and occasionally hundreds of thousands of acres annually. The time, however, inevitably comes when the vigour acquired by cross-breeding wears out, and the variety falls out of cultivation.

It is a very noticeable fact that those who grow on an extensive scale are the quickest to take up, and the earliest to discard, a variety. This comes of necessity, for they would soon be ruined otherwise. Those who grow on a small scale are less influenced by the profit or loss, and as the crop forms a smaller section of their business, they take less trouble to acquaint themselves with what is going on around them, and their varieties are generally a generation behind profitable time. There is also the occasional grower, who " thinks he will have a few acres of potatoes," and who often does not know the name of the variety he grows. It is in gardens, however, that relics of the past are chiefly to be met with; and how extensively old kinds are planted can be seen by reading trade lists, for in nearly all one sees names which those who grow with profit have discarded for many years.

It is an open question whether more harm than good is done by prize competitions for plates of potatoes. In almost all cases appearance is the sole feature on which they are judged. The many far more important features which go to make a variety

profitable are absolutely ignored. Many of the most popular varieties on the bench have never been profitable to grow; and though they may have deteriorated by years of growing, they may produce a few tubers suitable for show purposes, so that they are regarded by many as suitable, or even the best to grow. A very bad feature of many of these worn-out varieties is that they readily succumb to disease, and are the means of spreading it to others which would ordinarily escape serious attack.

It has been stated that the profitable career of a variety lasts over a very few years, and even before it becomes unprofitable new ones may have been produced which are far more profitable to grow. It is certain that for the greatest profit to be obtained the whole area under potatoes, with the exception of a few grown for special purposes, should be cropped with altogether new varieties within the space of a few years, old varieties giving way to new ones as their profitable career closes. All soils, however, do not maintain a variety at a profitable scale for an equally long period, and a variety profitable on many soils may always be unprofitable on others.

As the profitable career of a potato is of short duration, it is highly desirable to develop it as rapidly as possible, when once it is proved to be one worth growing on an extensive area. There is no doubt that a vast sum of money has been lost in the past through not growing the varieties which at the time are most profitable. As there is a considerable importation of potatoes the effect of this is all the more marked. Loss occurs through delay in not taking up new varieties of merit as soon as they are available. Every year lost implies a loss to the farming community. As soon as a variety gives evidence that it has all-round merit it should be developed to its utmost. That is, as every eye of a tuber is a plant in embryo, every eye should be planted separately. This has not been done as much as it should be; consequently, owing to the smaller quantity planted, it takes a longer time for the merits of a variety to be recognised by the public; and probably two or three years of the profitable period of a potato's career are to all practical purposes lost.

Farmers are recognising much more than they did a few years ago that developing new breeds of special merit as soon as they can get them from the introducer is a specially profitable business,

and that the profit is greater during the period in which they possess "seed" value than when, through ample supply, they have only a culinary value. Although the "seed" or sets may cost what appears to be an abnormal price during the first four or five years, and in the first year or two what, except to those who have followed the work, appear almost prohibitive prices, this is the most profitable period in the career of a variety. The making of new breeds is best left to experts, who are the introducers of new varieties; the developing then falls to gardeners and farmers. As showing the possibilities of the developer, for example, a certain variety recently introduced sold readily at £20 or more per ton this year. It has been grown by developers for three seasons, and was put on the market at twenty times its present value. We will trace the yield of 1 lb. of these potatoes. By growing from each eye 100 lb. could be grown in the first year. From these 10,000 lb. could be grown in the second year. With this quantity cutting out single eyes would not be ordinarily practicable, but by cutting this nearly 4½ tons into small sets it would be quite easy to grow 10 acres, giving 10 tons per acre, or 100 tons. We can instance a grower who achieved this yield last year over a greater acreage. Beyond the cost of growing there is nothing to add but that of the original 1 lb., for there was no seed to buy after the first year. What is there in connection with farming that can show similar results?

Considerable excitement has been aroused during the past few months regarding another new variety, which exhibited exceptional disease-resisting properties last season, and which is regarded by experts as likely to be grown over a vast area during the next few years. It is now selling at 20s. per lb. We grew several poles at the rate of over 13 tons per acre, every plant being raised from a single eye. Our method was to cut out each eye, plant it in a separate 3-inch pot, and subsequently to transplant it; in fact, we took just about the same amount of trouble as one would with a geranium cutting. The demand is so active that doubtless next year it will be shown that the unprecedented price of 20s. per lb. has been a good investment. The fact is that one is dealing with a small monopoly of special value, and the monopoly is the nucleus of what in a few years will be required

over a large proportion of the 1,200,000 acres grown in the United Kingdom, to say nothing of those required in the Colonies and abroad.

It must not be taken that any new variety is capable of giving these exceptional returns; it must be an exceptional variety to do so. Hundreds of new varieties are brought out and do not become sufficiently profitable to pay the introducer for raising them. We would also warn those who would become developers against re-introductions. It has been our practice for many years to grow a small quantity of several new introductions yearly to test their merits, and we have never missed a year where we have not found instances where some new popular variety has not been re-named by a firm other than the original introducer, and very often a variety in this way receives many names. This sometimes happens some years after the original introduction. We can give instances where as much as £80 has been charged per ton under a new name for what, under its original name, could be bought freely for £5.

In respect to cutting out each eye singly, the planting in separate pots is done to guard the valuable young plant from injury from insects, such as wireworm, or from more minute eelworms which, as scavengers, rapidly infect dying or wounded vegetables, or even from bacterial decay; and, at the same time to provide the most favourable conditions for growth, and to have them under control against frost for a longer period. We usually transplant from the plots when the plants are from 4 in. to 7 in. high.

For nearly a century, experiments to prove whether cut or uncut sets are most profitable have been carried out without throwing much light on a very simple matter. The skin of a potato is a natural protection against insect and other attack; moreover, it retains moisture; consequently, an uncut set is able to overcome the most difficulties; therefore, on ill-prepared land, or during very dry periods, uncut sets give the young plant the best start. By liming the cut sets with fresh lime the risks alluded to are greatly lessened, and with this precaution, with land in good condition and well prepared, we should not give much more per ton for uncut sets than cut ones. There is one exception, however, as it is found in practice that

all those varieties developed from what are known as "recently introduced, soft, white-blossomed American first early, or early-second early varieties," thrive badly when cut. Typical of these are the Snowdrop and Early Puritan. Occasionally a variety other than one of the recent Americans does not do well when cut, and it is always advisable to look to this feature. A grower of some hundreds of acres of Snowdrops always says he never knew a Snowdrop wounded at digging time that did not decay during winter. As showing, however, how conditions affect cut sets, practically every freshly-cut eye, if limed at once, will grow and produce a good plant when pot-reared. From what has been said about cut sets, it is not difficult to understand that the size of a whole set is not a matter of such importance as some would claim. If planted deeply on badly-prepared, cloddy soil, a larger set is preferable. On well-prepared tilthy land, especially since shallow planting is being adopted so generally, a smaller set may do equally well. The modern dictum in respect to planting is, "the nearer the sun the stronger the shoot." In respect to the size of sets, however, it is important that they come from good stocks. A small set from a vigorous stock may be excellent, but after a variety has been out a number of years the tubers deteriorate in size, and may produce little beyond good seed size. Those obtaining sets from old stocks get poor crops, and no small portion of the seed sent to the Colonies and elsewhere is of this nature.

The features which go most towards successful potato growing are, soil of good depth, from medium to light in texture, affording the opportunity to secure a good seed bed; efficient surface drainage, so that even in wet weather the tubers will not lie in water-logged ground; freedom from deep-rooted plants, such as thistles, *Persicaria* and others, which take up moisture during droughts before it reaches the potato roots; a climate without excesses of drought, rain, or frost (either spring or autumn); and adequate manuring. The manuring of potatoes, as of all crops, simply means supplying to the plant its food in proper quantities at the proper time. There is nothing very special about manuring for potatoes, except that it should be liberal in comparison with that for cereals, especially in respect

to nitrogen and potash. The quantity required depends, of course, on the condition of the land, for manuring is effected merely to supply the deficiencies of the soil. It may require none, or much, and each field must be judged on its merits or requirements. As a guide, take a wheat stubble which would ordinarily be sown with a root crop; then on average soil, fairly well farmed, 15 to 20 tons of good, well-rotted farmyard manure, 4 to 5 cwt. of superphosphate, 1 to 1½ cwt. of sulphate of potash, and 1 cwt. to 2 cwt. of sulphate of ammonia will give a good marketable crop. More ammonia may be applied, but where the cultivation is good and the variety vigorous there is a tendency to produce too many coarse tubers. On land after restorative crops and in good condition, smaller dressings suffice; on land in very poor heart more should be applied. Half the ammonia should be applied at about the time of planting, and the other half at the first moulding, or if sulphate of ammonia be used it should be applied at the second dressing, between the rows, as it scorches the leaves; the moulding will bring it to the plants. It is obvious that a late heavy-cropping variety requires more manuring than a first early, which crops lighter.

The time for applying farmyard manure is a question on which even good growers differ. Most potatoes are now put in "on the ridge," though there are districts where "flat" planting prevails. On the flat it is necessary to get the dung well incorporated with the soil before planting, and its application is made in autumn or winter. Theoretically, and to a great extent practically, the nitrates are washed out of the land during the winter; but many conversant with the fact prefer to apply the dung in autumn, even when well rotted, so as to ensure thorough incorporation, as practice has shown them that they get better crops thereby. These, however, generally manure very liberally—up to 30 tons per acre—and mainly grow early or second early varieties, on light land in dry climates, the object of the heavy manuring being very largely to retain moisture.

On the ridge system the manure is either applied in late autumn or early in winter, to be turned in in the first ploughing, to decay sufficiently, not to be too long to hinder subsequent

workings. Or it is applied between the ridges, the sets being placed on it. As to the relative merits of these two systems, the first is rather better suited to light land; the latter to somewhat heavier land inclined to set hard, because, as the manure decays, the soil is left hollow and the tubers keep a better shape than when they have to squeeze the hard soil aside when forming; moreover, the manure makes a division between the soil and the subsoil, enabling the digger to work more easily and with less bruising to the tender tubers. The application of the manure earlier in the year enables the work to be done at a less busy season, and its incorporation with the soil holds up moisture in time of drought, and undoubtedly at times is a means of preventing supertuberation or second growth, which would occur if the plants were checked in growth. The extent to which it is desirable to rot manure before applying it is dependent on the season at which it is applied, and whether the crop is of an early or late variety, an early one, of course, requiring the most thorough rotting because the period of growth is short.

As a method of procedure in growing on a good light potato soil the following is found a reliable practice:—Manure in December, and at once plough at least eight inches deep. Towards the end of February or beginning of March cross-work with steam or heavy cultivator as deep as the plough. According as the land comes wet or dry out of winter it may be ploughed again when well worked, or may be left for a time. As planting approaches it requires to be laid up in ridges, preferably thirty inches apart, to allow working room between the rows, and the manures should then be sown. The sets, according to variety, require to be placed from a foot to 16 inches apart. (Very early potatoes may be planted much closer, from 20 inches to two feet from row to row.) The tubers may be covered as much as six inches by splitting back the ridges, for, as soon as the weeds appear, the land should be harrowed and brought flat, which will leave the tubers very near the surface. As soon as the rows of potatoes can be seen to afford a guide, the land between the ridges should be thoroughly worked with a stout 5-tine single-row cultivator. Much of the success of the crop depends upon this. It should be started

early, and the tines should work very closely to the sets—closer than those who may not be accustomed to it might be prepared to go for fear of disturbing the sets. The space between the drills should be kept well stirred until moulding is started. Some of the most successful growers of our acquaintance mould twice or more, beginning with a shallow moulding, and getting deeper on each occasion, by which means successive growths of weeds are smothered. The hand hoe is thus never used. Others make one moulding suffice, but they usually find it necessary to hand-hoe to keep the weeds in check. The advantage of setting drills 30 inches apart becomes very obvious, both when working between the drills and when moulding up.

The value of spraying to prevent the spread of potato disease has been clearly shown during the past dozen years or so, and a return to a series of wet seasons will undoubtedly cause it to be practised on a scale not nearly approached at present.

We are dealing only with the growing of the crop, so will not enter into the subject of harvesting beyond saying that, except for very young tubers dug "green" for the early market, we find the digger the best means of raising them.

Before the development of the Jersey potato trade, English growers had the advantage of practically the whole of the early or new potato trade. Malta, Teneriffe, Egypt, and other countries more favourably situated in respect to climate, are now strong competitors, and had they been more careful in their selection of varieties they might have kept the English grower practically out of the field. Jersey has shown the greatest care in the choice of varieties and in the selection and changing of the seed. Moreover, the growers instituted on a practical scale the "boxing" of potatoes to ensure greater earliness. This boxing of seed potatoes has now been largely adopted in parts of England and Scotland, so that during the last few years a considerable portion of the new potato trade has been regained. In climates free from undue risk of spring frosts a very profitable business has thus been established.

Sprouting is effected so that instead of the tuber lying some weeks in cold ground before it comes through to the surface, the period is much shortened; the appearance above ground being accelerated, maturity is earlier attained. Suitable-sized tubers

are placed in boxes in autumn, and stored safely from frost. Some little time before planting, however, they should be brought to light to harden them, particularly if through mildness of the season there is a tendency to excessive growth. Good stout, hardened shoots up to two inches in length are most suitable. They must then be handled carefully, so that in planting, shoots are not broken off. Uncut sets are undoubtedly the best for boxing, as, having no soil about them for a lengthened period, the moisture unduly evaporates from cut sets, and there is risk of dry rot.

Any shallow box may be employed, and many use trays which slide conveniently into framework in the storing house, the framework being arranged so as to carry the trays in tiers. However, the trade now supplies, for about 30s. per hundred, boxes of convenient size and shape, which, taking all points into consideration, may be regarded as best suited for their purpose. These boxes are 24 in. long, 12 in. wide, and 3 in. deep; the ends, however, are raised to 7 in., and are braced by a tie piece which answers the purpose of a handle, thus facilitating carrying. The sets are placed indiscriminately into the boxes so as to fill them level with the sides. When the planting season arrives they are carefully planted.

Earliness in producing tubers is of highest importance, for the price falls rapidly week by week after the first supply of new potatoes is in. The Ashleaf possesses in a marked degree the peculiar flavour associated with new potatoes, and as this is so well known by the consumer, there is a preference for kidneys of this type, of which Sharpe's Victor is another favourite. In our trials during the last two years we have, however, been much impressed by a very vigorous new variety, the Sir John Llewellyn, and our opinion has confirmation in the fact that its price is more than double this year what it was last year, a very unusual occurrence in the history of a potato when it has been before the public four or five years. Its heavy cropping powers, excellent quality, and the fact that there is no earlier variety, ensure its being widely planted by those who grow for the early market. The Puritan, a round variety, is largely grown in some districts, and the Duke of York and Ninety Fold are other good varieties of the kidney type.

In conclusion, we strongly urge growers to be on the alert for varieties which possess vigour to resist the potato disease. For a number of years we have had dry seasons, and our summers have been too dry for disease to spread seriously. Last summer was rather showery, and there was more disease than for several years. When one looks back on the wet years about 1879 and remembers how badly potatoes succumbed to disease, the necessity for regarding this feature of resisting disease as being the most important of all in a variety of potato cannot be lost sight of. Those whose experience does not take them back so far may not realise this. But there is the fact that practically since 1887 we have been fine-weather farmers. The prolonged dry cycle must come to an end some time unless our climate has permanently altered. This there is no reason to believe, and at any time we may start on a series of wet years.

W. J. MALDEN.

PRESERVATION OF EGGS.

The supply of eggs upon our markets is very irregular. During the spring and early summer months they are plentiful, both as regards home production and foreign imports. As a consequence prices fall considerably. In the autumn and winter new-laid eggs are scarce and realise high rates, whilst the returns for even the cheaper grades of foreign eggs, the major part of which are preserved or "pickled," are considerably above the spring prices. Hence an egg produced in November will command twice, and sometimes thrice, as much as it would in the month of April. If eggs were a non-perishable product, and they could be kept in prime condition from one season to another, these variations would be avoided and the extremes of prices prevented. But an egg under normal conditions deteriorates quickly. Vast quantities of eggs are kept, however, and when the natural deterioration is retarded or stopped they can be sold, if in a good state, at rates which leave a considerable margin of profit, even though they are not equal to "new-laids." Simple methods of preservation, too, are extremely useful as a means of regulating the domestic supply.

The following are the methods which, up to the present, have yielded the best results :—

Lime Water.

Upwards of one hundred years ago Letters Patent were granted to William Jayne for an egg pickle, composed of lime, salt, cream of tartar, and water, and this preparation, or a modification of it, is used extensively both at home and abroad. The pickle generally employed is made by mixing four parts by measure of finely slaked lime with twenty parts of water, and afterwards adding one part of salt. This solution should be prepared by mixing the lime and the water a week before it is

used, and stirring well together daily, adding the salt on the fourth or fifth day. The eggs should be placed in vats, or barrels, or crocks, and the cleared solution poured over them, taking care to avoid adding any of the lime sediment, otherwise there is danger of the solution becoming a solid mass. It is desirable not to fill the vessel with eggs, but to allow two or three inches of solution above the top layer. An excellent arrangement is to add a little fresh solution occasionally, in order to provide for evaporation. An egg preserved by this method is easily discernible by the roughness of the shell. When boiled the shell cracks, owing to the lime having caused the outer covering to become hard and brittle. This may generally be obviated by pricking the broad end with a needle before it is placed in the water.

Waterglass.

Waterglass is the name given to a solution of silicate of soda, which is prepared by dissolving the chemical in water. It is now largely sold in a concentrated solution, to which should be added five or ten times its bulk of pure water, in accordance with the strength. Experiments in America have shown that a 3 per cent. solution (*i.e.*, 3 per cent. of waterglass to 97 per cent. of water) has yielded as good results as that generally recommended, namely, 10 per cent. When the waterglass is added to the water, the two must be very carefully and thoroughly mixed. The eggs may be dipped in the waterglass and dried off, leaving a film on the shell, and then stored upon shelves, or they may be kept in the liquid until sold or used. The latter method is to be preferred. When taken out of the solution they are sticky, and before packing should be wiped or dried off.

Cold Storage.

The methods already described are suitable equally for large and small quantities, and may be adopted equally by the farmer or by the trader. Cold storage, in order to be profitable, must be operated upon a large scale, and, consequently, is not available to producers. In America this system is extensively employed, and large plants have been erected specially for the business. Eggs require to be unpacked and laid upon shelves or in trays,

and kept at an even temperature, not falling below 33 degrees Fahrenheit, with a free circulation of air, which air should be absolutely sweet. No other products may be kept in the same room, otherwise the eggs will be affected. By this method, provided that the eggs are new laid when placed in storage, they can be kept for many months in good condition, but great care is necessary in removing them for use, as a too sudden change of temperature causes rapid deterioration. In all cases they require to be used very speedily on removal from the cool chamber, and the evidence obtainable in this and other countries shows that cold storage eggs will keep for a much shorter period after they are taken out of the chamber, than if preserved either in solutions of lime or waterglass.

General Suggestions.

Eggs for preservation should be treated as soon as possible after they are laid, but not until they have been cooled. It is recognised that an egg twenty-four hours old is superior to and has greater food value than it would have at the end of a week. Consequently, if when preserved the egg has depreciated to this extent, the final result cannot be as satisfactory as under the former conditions. It is, therefore, desirable that preservation should be as near to the point of production as possible.

Eggs should not be treated in a warm place, and where lime-water or waterglass is used the preparation should be quite cold before the eggs are placed in the solution.

Eggs from hens fed chiefly upon grain, and with full liberty, are likely to keep better than those laid by fowls in confined runs.

The general experience has been that infertile eggs keep in good condition longer than those which contain a living germ. Probably this is less apparent when eggs are preserved at a low temperature.

When eggs are preserved in waterglass or lime-water the containing vessels should be stored in a cool place, at a temperature not less than 33 degrees Fahrenheit, or more than 45 degrees. A cool, sweet cellar is excellent for this purpose. Exposure to a higher temperature even for a few hours will cause deterioration, in spite of the preservative.

Preserved eggs should be carefully tested by light before they are sold. For this purpose a well-constructed candling-lamp is to be preferred, but a piece of black cardboard, 8 inches square, with an oval hole in the centre rather smaller than an ordinary egg, can be used. Each egg is placed against the hole, and held between a strong light and the eye, so that the condition of the contents can be observed. All dark eggs, or those showing spots or black shadows, should be rejected.

The best months for preserving are March, April, May and June. It has been found in many cases that summer eggs do not keep nearly so well as those laid prior to the hot days.

Preserved eggs should be sold under that designation, and not as "new-laids," or "breakfast," or "fresh" eggs.

EDWARD BROWN.

IMPORTS OF AGRICULTURAL PRODUCE IN 1902.

The following tables, which have been compiled from the Trade and Navigation Returns, show the quantities and values of the principal articles of agricultural produce imported into the United Kingdom during the past year compared with similar imports for 1901.

The receipts of live animals and dead meat, which are set out in Table I., exhibit a considerable diminution, the decrease in each case being due to smaller supplies from the United States. In the case of cattle, 324,431 head were received from that country, or 81,273 less than in the previous year. Canada, our only other source of supply, apart from the Channel Islands sent us 93,674 head. The number of sheep received from the United States was 233,227, which, compared with 1901, when the numbers were larger than on any previous occasion, showed a decline of 66,925. Canada accounted for 55,029 compared with 68,010 head in the previous year. The average value per head of the cattle imported in 1902 was £18 12s. 7d., and of sheep £1 11s., as against £17 16s. 11d. and £1 10s. 7d. respectively in 1901.

The same causes which reduced our supply of cattle from the United States also influenced the trade in fresh beef, and only 2,290,465 cwt. were received from that country, as against 3,180,291 cwt. in 1901. The decline in these exports is to be attributed to the shortage of the maize crop—the principal feeding stuff—which decreased the supply of fat cattle in the American markets, particularly in the summer months. Throughout the greater part of the year the prices of beef cattle in the United States were, in consequence, very high, and in spite of the increased prices prevailing in Great Britain at the same time, it is questionable whether the rise was proportionately as great as in the United States, a fact which

would largely account for the falling off in the exports. In the case of the Argentine Republic, however, the better prices obtainable for River Plate chilled and frozen beef drew out supplies, and the receipts from that country amounted to 923,748 cwt., as compared with 771,929 cwt. in 1901, and 412,262 cwt. in 1900. Australia, on the other hand, contributed only 65,860 cwt. as compared with 243,348 cwt. in 1901. The total quantity of fresh beef, including that estimated to be represented by the live cattle landed on these shores, amounted to 6,658,000 cwt., which may be compared with 8,013,000 cwt. in 1901, 7,618,000 cwt. in 1900 and 7,357,000 cwt. in 1899. The declared value of the fresh beef imported was 42s. 8d. per cwt. in 1902 and 39s. 6d. per cwt. in 1901.

TABLE I.

Imports of Live and Dead Meat.

Description.	Quantities.		Values.	
	1901.	1902.	1901.	1902.
	No.	No.	£	£
Cattle	495,635	419,488	8,840,664	7,814,753
Sheep	383,594	293,199	586,139	454,422
Total Live Animals ...	879,229	712,687	9,426,803	8,269,175
	Cwt.	Cwt.		
Beef, Fresh	4,508,746	3,707,387	8,906,839	7,905,144
,, Salted	204,396	153,574	267,356	244,002
Mutton, Fresh	3,608,229	3,659,599	6,598,080	6,914,911
Pork ,, ...	791,509	655,376	1,715,633	1,446,145
,, Salted	247,047	205,265	324,168	305,587
Bacon	5,772,348	5,089,704	13,590,176	13,426,967
Hams	1,860,670	1,482,287	4,528,388	3,859,002
Meat, Unenumerated—				
Salted or Fresh	610,271	655,023	1,120,447	1,199,140
Meat, Preserved... ...	769,348	910,886	2,282,305	2,785,529
Rabbits (dead)	391,867	451,457	648,826	734,326
Total Dead Meat ...	18,764,431	16,970,558	39,982,218	38,820,753

Not much change was noticeable in the total imports of fresh mutton, though the 1,635,037 cwt. credited to New Zealand represented an increase over the preceding year, as did also the 1,352,500 cwt. from Argentina, the larger amounts in both cases

counterbalancing the diminished supplies from Australia, which only sent us 279,134 cwt., as compared with 518,639 cwt. in 1901.

The decline in the amount of dead meat imported from abroad was not confined to beef, the quantities of fresh and salted pork, bacon and hams being in each case smaller than in the preceding year, but it may be noticed that here also the decline was mainly attributable to a falling off in the imports from the United States. In the case of bacon, these amounted to only 3,283,855 cwt., or 960,474 cwt. less than in the previous year. In accordance with a tendency which has been a noticeable feature for several years past, bacon showed a substantial rise in the average declared value from the 47s. 1d. recorded in 1901 to 52s. 9d. per cwt., a rate which may be compared with 41s. 9d. in 1900 and 35s. 10d. in 1899. Imported hams have also been increasing in value, and averaged 52s. 1d. as against 48s. 8d. last year.

The imports of dairy produce, margarine and eggs are included in the next table. The aggregate value of these articles in the past year amounted to £37,650,390, an increase of £2,270,374 over 1901, and of £3,720,715 over 1900.

TABLE II.

Imports of Dairy Produce, Margarine and Eggs.

Description.	Quantities.		Value.	
	1901.	1902.	1901.	1902.
	Cwt.	Cwt.	£	£
Butter	3,702,890	3,974,177	19,297,396	20,527,934
Margarine	962,127	966,170	2,556,679	2,569,453
Cheese	2,586,837	2,546,384	6,227,135	6,412,420
Milk, Condensed ...	919,319	914,087	1,760,516	1,803,036
Milk and Cream, Fresh..	24,422	22,030	42,523	37,613
	Gt. Hundreds	Gt. Hundreds		
Eggs	17,071,767	18,930,513	5,495,767	6,299,934

Our imports of butter amounted to 3,974,177 cwt., a figure exceeding that of any previous year. The largest quantity was received from Denmark, which sent 1,703,032 cwt., or 43 per

cent. of the total. The second place was held by Russia, which has been making very great progress in this trade within the last few years, the 489,000 cwt. credited to that country being 111,000 cwt. more than in 1901, and 280,000 cwt. more than in 1900. The imports from France, which had been declining, showed a recovery from 312,000 cwt. in 1901 to 414,000 cwt. last year. The contributions from British Colonies amounted to about 524,000 cwt., including 80,500 cwt. from Australia, 158,000 cwt. from New Zealand, and 285,800 cwt. from Canada. The average value of the imports of this commodity was 103s. 4d., as against 104s. 3d. in 1901.

Little change has to be recorded in the total imports of cheese, but a further improvement took place in the position occupied by Canada, from which country we received 1,709,566 cwt., or 67 per cent. of the total. The United States supplied 390,479 cwt., and Holland 284,018 cwt., a quantity smaller in each case than in the preceding year. The average value of the cheese imported was 50s. 4d. per cwt., or 2s. 2d. more than in 1901.

The imports of fresh milk and cream comprised 13,559 cwt. of fresh milk, 5,413 cwt. of cream, and 3,058 cwt. of preserved milk. Practically the whole of the supply of fresh milk, as well as 3,053 cwt. of cream, came from France.

The past year saw an increase in this country's consumption of foreign eggs. They were received chiefly from Continental countries, although Canada, Egypt, Morocco, and the United States also share in the trade to a small extent. Russia sent us 5,304,000 great hundreds in the past year, Denmark 3,518,000, Germany 3,931,000, and Belgium 2,627,000, quantities which were in each case the largest consignments yet received. The value of the eggs imported from different countries varies considerably, those from France, for instance, having an average value of 8s. 6d. per 120, while those from Russia were valued at only 5s. 8d. per 120.

The imports of horses, poultry, wool, and other miscellaneous animal products are shown in the next table. The imports of wool were nearly 50,000,000 lb. less than in 1901, and with the exception of the year 1900, they were less than in any year since 1890. This was attributable to the diminished receipts, viz.,

269,000,000 lb., compared with 334,000,000 lb. from Australia, where the drought has seriously decreased the flocks in many districts. Notwithstanding the smaller quantity imported, the re-exports amounted to 284,000,000 lb., and the net quantity of foreign wool retained in this country in 1902 was 354,000,000 lb., as compared with 394,000,000 lb. in 1901. The greater portion of these re-exports goes to the Continent, but about 55,000,000 lb. were sent to the United States. The average value of imported wool stood at the same figure, viz., 7½d. per lb., as in the preceding year.

The imports of poultry and game exceeded in value those of any previous year. This trade is now chiefly in the hands of Russia, Belgium, France, and the United States; from the first-named country the receipts were valued at £218,500 and from Belgium at £281,000.

TABLE III.

Imports of Horses, Poultry, and Miscellaneous Animal Products.

Description.	Quantities.		Value.	
	1901.	1902.	1901.	1902.
			£	£
Horses ... ... No.	40,856	32,686	1,095,683	835,737
Poultry and Game £	—	—	980,757	10,59,060
Lard ... ... cwt.	1,966,256	1,650,830	4,037,689	4,118.990
Tallow and Stearine ,,	1,785,319	1,782,098	2,333,246	2,708,687
Wool, Sheep, Lambs lb.	686,956,308	637,521,986	21,504,577	19,936,449
Sheepskins, undressed No.	15,109,399	16,301,695	1,472,672	1,611,066
Hides ... ... cwt.	757,175	661,350	1,782,779	1,595,378

The imports of wheat and wheat flour expressed as grain amounted to 107,979,000 cwt., a larger quantity than in any previous year, although the amount of wheat grain, apart from flour, did not equal the receipts in 1895, when 81,750,000 cwt. were recorded. The United States sent more than one-half of the total supply, and both in this case and in that of Canada—our next largest contributor—the quantity received represented the maximum yet credited to either country. The three British Possessions of India, Canada, and Australasia, taken together, supplied in 1902 more wheat, viz., 22,688,000 cwt., than

on any previous occasion. Russia furnished 6,540,000 cwt. and Argentina 4,315,000 cwt., while Roumania, the only country of importance in this connection, accounted for 2,362,000 cwt. The average value of the imported wheat grain was 6s. 8d. per cwt., as against 6s. 7d. in 1901.

The arrivals of flour were less in 1902 than in any year since 1897, the deficiency being entirely due to smaller receipts from the United States, which sent only 15,606,000 cwt. compared with 19,000,000 cwt. in 1901.

The imports of barley included 14,890,000 cwt. from Russia and Roumania, compared with 11,658,000 cwt. in 1901 and 6,144,000 cwt. in 1900. The average declared value of the grain from these two countries, which is believed to be largely used for feeding to stock, was 5s. 2d. per cwt.

TABLE IV.

Imports of Grain and Flour.

Description.	Quantities.		Values.	
	1901.	1902.	1901.	1902.
	Cwt.	Cwt.	£	£
Wheat	69,708,530	80,925,886	23,081,372	27,058,049
Wheat Meal and Flour	22,576,430	19,478,199	10,341,519	8,947,747
Barley	21,873,430	25,199,312	6,163,012	7,130,992
Oats	22,470,670	15,857,157	6,347,719	5,041,321
Oatmeal	840,335	612,712	546,132	486,066
Maize	51,372,700	44,485,274	12,387,225	11,710,773
Maize Meal	1,638,026	242,840	457,345	83,270
Peas	2,042,711	1,746,210	747,168	667,236
Beans	1,868,560	2,065,499	629,831	703,621
Other Corn and Meal...	1,736,201	1,897,990	475,545	576,147
Total	—	—	61,176,868	62,405,222

The heavy imports of oats in 1900 and 1901 were not maintained in the past year, and the quantity recorded, viz., 15,857,000 cwt., was only slightly in excess of that of 1899. Proportionately, however, to the total, Russia contributed as much, viz., 8,935,000 cwt. as in 1901, when her consignments amounted to 12,609,200 cwt. The average declared value of

the imports of oats was 6s. 4d. per cwt., as compared with 5s. 8d. per cwt. in 1901.

An interesting feature of the year was the almost complete stoppage of maize exports from the United States, in consequence of the small crop of 1901, but owing to satisfactory harvests elsewhere their absence was largely compensated for by augmented contributions from other countries. The total receipts from the United States only amounted to 1,975,000 cwt., whereas they were 25,565,000 cwt. in 1901 and 38,422,000 cwt. 1900. To counterbalance this deficiency, however, Roumania sent 18,592,000 cwt. instead of 10,016,000 cwt., Argentina 13,387,000 cwt. as against 10,443,000 cwt., and Russia 6,590,000 cwt. compared with 1,881,000 cwt. in the previous year. The average declared value of the maize imported was 5s. 3d. per cwt., a rise of 6d. over the value in 1901.

TABLE V.

Miscellaneous Imports of Vegetable Produce.

Description.		Quantities.		Values.	
		1901.	1902.	1901.	1902.
				£	£
Onions	bush.	7,295,418	7,606,119	869,397	999,952
Potatoes	cwt.	7,076,726	5,699,090	1,851,587	1,589,533
Tomatoes	,,	793,995	783,894	733,471	700,126
Vegetables, unenumerated	£	—	—	389,829	467,022
		Cwt.	Cwt.		
Apples		1,830,210	2,843,701	1,182,782	1,923,482
Pears		348,866	491,906	296,411	439,536
Plums		263,700	541,136	243,705	515,059
Cherries		212,683	166,359	213,585	216,421
		Bunches.	Bunches.		
Bananas		2,228,672	2,805,700	875,540	1,060,263
		Cwt.	Cwt.		
Strawberries		38,604	40,211	51,290	58,080
Currants		70,402	76,080	75,308	92,112
Gooseberries		21,735	27,557	11,420	16,919
Hops		116,042	191,324	461,355	798,588
Flax		1,511,300	1,472,220	2,606,565	2,592,912
Hemp		2,724,300	2,377,180	4,033,109	3,968,273
Clover and Grass Seeds		281,129	337,800	611,618	740,329
Wood and Timber (except Furniture Woods, Hardwoods, and Veneers)		Loads. 9,193,959	Loads. 9,607,740	22,499,587	23,277,114

Among the miscellaneous articles of vegetable produce shown in Table V., onions, apples, pears, bananas, plums, hops, seeds and wood were imported in increased quantities. In the case of potatoes 1,378,000 cwt. less were received, the decline being chiefly noticeable in the imports from Germany, which only sent 259,000 cwt. in place of 1,257,000 cwt. in 1901. The imports of apples increased from 1,830,000 cwt. to 2,844,000 cwt., of an average value of 13s. 6d. per cwt. The receipts of hops were 75,282 cwt. more than in 1901, of an average value of 83s. 6d. per cwt. as against 79s. 6d. per cwt. Timber (other than furniture woods, hardwoods and veneers) came chiefly from Russia, Scandinavia, Canada and the United States. The value per load was 38s. 8d. for hewn timber, and 51s. 5d. for sawn timber.

SCHEMES FOR MANURIAL AND OTHER AGRICULTURAL EXPERIMENTS.

Experiments and demonstrations on growing crops have long been practised in this country, as is evidenced by the fact that even so early as 1770 Arthur Young published two large quarto volumes containing the results of nearly 2,000 original experiments which he himself had carried out, chiefly at Bradfield, in Suffolk. Later, the same agency in the improvement of agriculture has been largely and successfully made use of by Sir John B. Lawes and Sir J. Henry Gilbert, as well as by the leading agricultural societies.

During the past ten years this class of work has undergone great extension, chiefly as the result of the funds placed at the disposal of County Councils, who recognised in it a means of presenting information to farmers in a form that would prove at once useful and interesting. To a large extent the work was delegated to the agricultural colleges and agricultural departments of colleges, whose reports of results have come to be a familiar feature of agricultural education in agriculture.

In the earlier years of this recent development an attempt was often made to distinguish between experiment and demonstration, and while such a distinction may frequently be made, there are many cases where the two forms of field work so completely overlap that it is practically impossible to draw any line of demarcation. Generally speaking, the term experiment would be used where, for example, the unknown action of some new substance, or of some substance put to a new use, was under trial. A demonstration, on the other hand, is generally regarded as the repetition of some well-known experiment, or of some agricultural process whose results, under normal conditions, may be confidently predicted.

Strictly speaking, most of the field work of recent years is demonstrational rather than experimental, and, in fact, from the

educational point of view, is closely analogous to the practical illustrations which are a usual accompaniment of instruction in chemistry or physics. Such demonstrations need lay no claim to originality, but, like all illustrations designed to educate, they should have a definite object, and should be performed with neatness and accuracy.

It has been objected that much of the recent field demonstrational work has been characterised by monotonous repetition—in other words, that the demonstrations of one centre and one year have been repeated at other centres and in other seasons. Such objections would appear to be founded on a misapprehension of the objects of these demonstrations. They are designed not to discover new principles but to exemplify old ones. Their purpose is to supply practical illustrations or object-lessons of the results of certain processes, and as each year brings new students, or interests a new set of farmers in the work, so should the same typical object-lessons be provided for their instruction. Another reason for repeating the same demonstrations in different districts and in consecutive seasons is that variations in soils and seasons influence the results of processes and the action of substances, like manures. It becomes, therefore, of importance to discover an explanation for variations in results, and then a demonstration approaches more closely to the character of a true experiment.

It has also been urged that there has been a lack of co-ordination or relationship in the demonstrational or experimental work that has been conducted at the various centres. This objection is, on the whole, well founded, and is recognised as much by those who direct the work as by the class for whom the work is undertaken. One outcome of the desire for co-ordination is a series of joint rotation experiments, started in 1897 and still in progress, some of the results of which have appeared in the Board's Reports on the Distribution of Grants (see C. 9061, C. 9431, Cd. 310, Cd. 814, Cd. 1242). Many of the field tests carried out by agricultural societies are also of a thoroughly co-operative character.

In the past the general method of performing demonstrations has, for the most part, been the same, but the details have often been unnecessarily varied. Such isolated work has, in the case

of fertilisers, prevented easy comparison of the action of definite quantities of manurial elements on different crops, in different districts, and on different geological formations. The difficulty of making such a comparison may possibly, however, not be so great as it seems, and the Board are at present co-operating with the Agricultural Education Association in summarising and collating the results obtained during the past twelve years with a view to their being made more convenient for reference.

This association, a voluntary body, which was founded in 1894, and has as its object the development of agricultural education by mutual assistance and advice amongst its members, originally consisted of representatives of the agricultural departments in those English and Welsh colleges where such departments had been organised. During the last few years the scope of the association has been considerably enlarged, and it now embraces members of any organisations or institutions connected with agricultural education and research who themselves are, or have been, engaged in teaching or research.

The association has now submitted schemes for joint experiments for general adoption by its members, as well as by others who may be disposed to co-operate in the work. Most of these schemes are of so simple a character, and so direct and practical in their objects, as to be capable of general adoption by farmers. Every farmer should be more or less of an experimenter, and the advantage of his testing the manurial requirements of his own fields, on the lines of the association's schemes, is that he has thereby the opportunity of comparing his results with those obtained in other parts of the country. If he places himself in communication with the collegiate centre that serves his district he will, doubtless, have the opportunity of availing himself of the services of the staff, and such a course would carry with it the additional advantage of securing the inclusion of the results obtained on his farm with those obtained in the same and other districts.

In encouraging the Agricultural Education Association to formulate schemes for joint action, the Board were far from desiring to do anything that would in any way interfere with individual initiative. The field for original experiment and research is still as open as ever for workers whose time and

opportunities lead them in that direction, and, doubtless, the future still holds many valuable discoveries for the patient investigator.

So far, the association has confined itself to formulating schemes for joint action in the case of manurial demonstrations, and even this comparatively limited sphere of work cannot be said to have been exhaustively treated. But there remain many other directions in which co-ordination of effort is possible, and, doubtless, attention will be given to these as opportunity offers. For the present, however, it is extremely desirable that the schemes already prepared should have a full and fair trial, for it is evident that unless they are extensively adopted they will fail to accomplish the object for which they were framed. It would, therefore, be highly desirable that county authorities should carefully consider this matter, and, where field experiments are not already conducted under their auspices, endeavour to see whether it would not be possible to join in the work which is already being largely taken up throughout the country.

Copies of the association's schemes may be had upon application to the Board.

AGRICULTURAL AND MISCELLANEOUS NOTES.

EXPERIMENTS IN THE GROWTH OF MAIZE FOR FODDER.

For at least thirty years past maize has been grown for fodder to a limited extent in a few districts of England, and yet its cultivation has spread so slowly that it is quite rare to meet with it. Several farmers, however, never fail to put in a considerable break annually, and always speak well of it. In Canada and the United States fodder maize is chiefly made into silage, and for the most part in what are known as "stave" silos. Not only are such silos well adapted for the purpose in view, but they are also cheap, and, being of wood throughout, may be regarded as a tenant's fixture.

With the object of gaining further information as to the prospects of an extension of this crop in England, and also of testing a few of the chief varieties of seed, the Board of Agriculture made arrangements last year to carry out experiments in growing this fodder in the warmer districts of England and Wales, under the supervision of the Agricultural Colleges.

The Board undertook to supply a sufficient quantity of seed for tests to be conducted at four centres in counties associated with the University College of Wales, Aberystwyth; the University College, Reading; the Midland Agricultural and Dairy Institute; Cambridge University; and the South Eastern Agricultural College, Wye. At Wye a stave silo was erected in order that this means of conserving maize might be tested. To fill the silo, and thus test it properly, enough seed was provided to sow a larger area on the College farm there than at the other centres. The results of the storage of maize forage in this form of silo will be available later.

Ultimately, the seed was sown at eighteen stations, viz., two centres in Cardigan and one in Montgomery, in connection with Aberystwyth; one in Hampshire, one in Dorset, and one in Oxford, in connection with Reading; one in Nottingham in

connection with the Midland Agricultural Institute; three in Norfolk and one in Cambridge, in connection with Cambridge University; one in Surrey and six in Kent, in connection with Wye College. At the centre in Cambridge (the University Farm), the plots were duplicated. Difficulty was experienced in Kent in finding occupiers of land who were willing to devote two acres to the trials, with the result that about half the area was sown at several localities in Kent, the plots being of the same size as the others (¼ acre), but fewer varieties being included in the test.

The germination of the seed was determined at Wye, with the following results:—

Leaming Corn, Canadian Seed	65 per cent.
Compton's Early Flint, Canadian Seed	91 ,,
Longfellow Flint, Canadian Seed	94 ,,
Angel of Midnight Flint, Canadian Seed	100 ,,
Early Baden, German Seed	87 ,,
Horse-tooth, German Seed	99 ,,
Ordinary Commercial, United States Seed ...	80 ,,

Instructions were given that the seed should be sown on quarter-acre plots, on the same day at any one place, and some time between May 26th and June 7th. Any method of sowing and manuring indicated in the Board's leaflet on the cultivation of maize* might be adopted. Attention was specially directed to the necessity for protecting the germinating seed against birds, especially rooks, but unfortunately this precaution was not always observed.

The main results of the experiments are indicated in Table I., which gives the date of sowing, the amount of seed per acre, the character of the soil, the manures applied, and the previous cropping, with a statement of the average yield in those cases where the crop was properly weighed. In Table II. are given the weights per acre obtained from each kind of seed at each station where the crop was weighed, with averages.

In several cases the experiment failed, mainly owing to the seed being devoured by rooks, and one important lesson to be learnt from these trials is that it is absolutely necessary to keep the rooks off. Stringing the field was generally successful in this respect. It must also be borne in mind that 1902 was

* See Leaflet 73, or *Journal*, Vol. VIII., March, 1902, p. 470.

exceptionally wet and cold, and therefore an unfavourable season for testing this crop, and several of the failures are set down to the bad weather which followed the sowing of the seed.

TABLE I.—PARTICULARS OF EXPERIMENTS IN THE CULTIVATION OF MAIZE.

No.	County.	Date of Sowing.	Seed Sown per Acre.	Character of Soil.	Manuring per Acre.	Previous Cropping.	Average Yield per acre or other result.
1	Cardigan ...	—	—	Deep loam, with fair amount of organic matter	2cwt. kainit, 4cwt. super.; and later, 2 cwt. nitrate	—	7 ton
2	,, ...	—	—	—	,,	—	Failed
3	M'ntg'mery	—	—	—	,,	—	,,
4	Dorset ...	June 3	—	Fairly strong loam on chalk subsoil.	None	Oats after wheat grown with farmyard.	Crop very small; not weighed
5	Oxford ...	May 30	—	Good light loam on Northampton sand	Folded with ewes and lambs getting cake	Swedes & 1,000 headed kale with 10 loads farmyard and 3 cwt. super.	Failed
6	Hampshire	May 29	16 inch between rows.	Gravelly clay	10 ton farmyard	Barley	15 ton 17 cwt.
7	Notts ...	June 3	7 pecks drilled 2 ft apart	Clay loam, on blue lias in good heart and clean	20 loads dung, 3 cwt. super., ¾ cwt. sulph. amm	—	Failed
8	Cambridge	June 6	2 bushels, 3¼" deep 18" apart	—	—	—	17 ton 7 cwt.
9	,, ...	June 6	,,	—	—	—	11 ton 6 cwt.
10	Norfolk ...	June 3	2 bushels	Light, good, on brick-earth subsoil.	1 cwt. sulph. amm., 3 cwt. super., 3 cwt. kainit.	Wheat with 14 loads dung	7 ton 13 cwt.
11	,, ...	June 4	—	Lightish, subsoil sand	10 loads dung, later top-dressed 3 cwt. nitrate	Barley after roots	10 ton 19 cwt.
12	,, ...	—	—	—	—	—	Failed
13	Kent ...	May 28-9	1½ bushels per acre, 2½" deep, drills 2 ft. apart	Poor, chalky	Dung	—	15 ton 4 cwt.
14	,, ...	—	—	Light calcareous loam	—	—	Failed, not weighed
15	,, ...	—	—	—	—	Rye	Failed
16	,, ...	June 19	Drilled rather over 2 bushels.	Alluvial, on Weald, good condition	2 cwt. super.	—	11 ton 14 cwt.
17	...	June 6	Dibbled, 1-1½ bushels	Weald clay, somewhat sandy	7-8 ton farmyard, 1 cwt. nitrate on June 6 and again early in August.	—	9 ton 4 cwt
18	,, ...	June 17	Dibbled, 1½-2 bushels	Clay loam ...	Good dressing of peat dung	—	14 ton 18 cwt.
19	Surrey ...	May 31	Drilled, 2 bushels 3½ inches deep 2 ft. apart	Sandy loam, good	None	Mangolds, heavily manured	10 ton 9 cwt.

Taking first the centres where negative results were obtained,

the following details are given concerning the cause of failure. [The numbers correspond to the numbers of the stations in Table I.]

TABLE II.—YIELD PER ACRE OF EACH VARIETY OF MAIZE AT EACH CENTRE.

	Canadian Seed.								German Seed.				American Commercial.		Average.	
	Leaming.		Compton.		Longfellow.		Angel of Midnight.		Baden.		Horse-tooth.					
	T.	C.	T.	C.	T.	C.	T.	C.	T.	C.	T.	C.	T.	C.	T.	C.
(1) Cardigan	7	0	5	2	9	2	8	4	6	7	10	5	3	1	7	0
(6) Hampshire ...	12	19	13	11	13	14	15	19	17	18	18	10	18	10	15	17
(8) Cambridge ...	15	3	17	18	19	8	15	11	19	16	22	6	11	10	17	7
(9) ,, ...	9	17	9	1	9	15	11	12	15	5	18	10	5	0	11	6
(10) Norfolk	4	19	11	0	5	11	8	9	7	0	9	18	6	15	7	13
(11) ,, ...	12	12	13	12	15	0	11	14	14	2	17	10	10	4	13	11
(13) Kent	15	18	15	4	16	14	16	16	11	3	19	0	11	16	15	4
(16) ,, ...	—		13	3	11	18	—		9	0	12	15	—		11	14
(17) ,, ...	6	10	11	0	—		10	3	—		—		Failed*		9	4
(18) ,, ...	15	0	15	0	—		—		14	14	not wghd.*		—		14	18
(19) Surrey	10	10	11	5	9	7	9	3	13	6	16	8	3	1	10	9
Average ...	11	1	11	18	12	5	11	19	12	17	16	2	8	15	—	

* Not included in Average.

(2). Cardiganshire, Lampeter.—The crop was a failure and had to be ploughed up; the failure can only be attributed to rooks and pheasants. The opinion was expressed that maize is not likely to become a useful forage crop in Wales.

(3). Montgomeryshire, Llandinam.—The failure was due to the quality of the soil, which was heavy and wet, and to the unfavourable season.

(4). Dorsetshire, Bryanstone.—Failure thought to be due to the hollow state of the land, which was also in very poor condition. Produce not weighed.

(5). Oxfordshire, Great Rollright.—No braird was obtained, as the rooks carried off practically the whole of the seed, in spite of stringing on the day of sowing.

(7). Nottinghamshire, Colston Bassett.—The plots were carefully watched to keep off the rooks, but on one holiday, when all the watchers were absent, they were entirely ruined by these birds. Only one variety, the Horse-tooth, either resisted or escaped, and of this $37\frac{3}{4}$ cwt. were obtained on $\frac{1}{8}$ acre.

(12). Norfolk, Saxlingham.—The plots were a failure and had to be ploughed up. No special cause is assigned.

(14). Kent, Charing.—The plant was so patchy and overgrown with weeds that it was not weighed. The plant had been much injured by jackdaws. A plot of shallow seeding was a complete failure, being attacked immediately after sowing by small birds and jackdaws, and it was found impossible to keep the former off.

(15). Kent, Leigh.—Immediately after the seed was sown a wet period set in, followed by drought, and this caked the land like a board, so that the plant could not come through.

As regards the plots where all or most of the produce was weighed, the following particulars are of interest:—

(1). Cardiganshire, Tregaron.—The result was fairly satisfactory, but the crop required such frequent cleaning that the farmers in the district condemned it. The season was, however, most unfavourable, being wet and cold. The produce was fed to dairy cattle in the green state, and eaten with avidity, an increase of 30 per cent. being reported in the milk yield.

(6). Hampshire, Old Basing County Council Farm.—The plots were only about a fourth of the regulation size.

(8 & 9). Cambridgeshire, Cambridge University Farm.—The duplicate plots do not come out very well, although they come out in very similar order to the others. They were only half the size of the main plots.

(10). Norfolk, Whitlingham, and (11) Warham.—The plant at Whitlingham was better than at Warham; this is probably due to the former being in a small field well sheltered by trees and fences.

(13). Kent, Wye College.—Besides the varieties sown at the other centres in England and Wales, further varieties were grown at Wye, and yielded the following amounts per acre, viz.: Mitchell's Early, 14 tons 19 cwt.; Whitecap, 5 tons 17 cwt.; Mastodon Dent, 15 tons 4 cwt.; Canada White Flint, 13 tons 13 cwt.; and ordinary American feeding maize, supplied by a local merchant, 19 tons 19½ cwt. Experiments were also conducted on four other plots with regard to the manner of sowing. Seed sown in 1 foot drills gave 22 tons 19 cwt., that sown in 3 foot drills gave 6 tons 6 cwt.; shallow sown seed yielded 14 tons 1 cwt., and late sown 7 tons 9 cwt.

(16). Kent, Staplehurst.—The whole piece appeared much stunted and too thick on the ground. All the varieties were severely affected by frost.

(17). Kent, Marden.—The American commercial seed failed, and was not weighed. The plants were slightly wet at the time of weighing, so that the quantities are probably some 5 per cent. too high.

(18). Kent, Chiddingstone.—Quite one-quarter of the whole crop was destroyed by rooks. After the damage was done stringing was carried out, and the rooks left the crop entirely. Practically all of the Horse-tooth, and some portion of the other varieties, was accidentally cut without being weighed, so that the weights are not considered reliable.

(19). Surrey, Merstham.—Besides the commercial seed supplied by the Board, two "local" varieties of commercial seed gave, the one 3 tons 17 cwt., and the other 18 tons per acre. Two plots were also drilled with local commercial seed in rows, $1\frac{1}{2}$ feet apart (equivalent to $2\frac{2}{3}$ bushels to the acre); these yielded 12 tons 1 cwt. and 15 tons 15 cwt. to the acre. The plots had suffered from frost, and were patchy and irregular. The patchiness is ascribed partly to an attack by rooks and partly to some of the seed being unable to break through a slightly caked condition of the soil which followed the drilling. It is thought that the calculated yields are below the reality, and that they might be increased by 10-25 per cent. On another farm in the district a local variety of commercial seed gave a crop estimated at 30-40 tons per acre. Some of the ordinary commercial varieties were fed to stock, one kind being greedily eaten, while another was not much liked.

The conclusion that these experiments lead us to is that where the conditions of soil and climate are favourable maize will give a large yield of useful fodder. No doubt a warmer and drier season than 1902 would have produced better results; in fact, it is when the conditions are unfavourable to the growth of ordinary green crops that maize grows best and proves most useful. Great care should be taken to select a variety with a good reputation, and failure is certain to follow any neglect to thoroughly protect the germinating seed against the ravages of birds, especially rooks.

COLD STORAGE OF FRUIT.

In the report of the United States Agricultural Department for 1902, reference is made to certain investigations which are being conducted by that Department into the influences which govern the keeping qualities of fruit and vegetables in cold storage. Though the observations will require several years before any general conclusions can be deduced from them, important commercial results have already been obtained.

With regard to "scald," or skin discoloration, which is one of the serious storage difficulties with many varieties of apples, and the cause of which is as yet undetermined, the investigations are stated to have shown that the susceptibility can be largely reduced by allowing the apples to become more highly coloured or more mature than usual before picking, and it is held that this greater maturity does not diminish their keeping qualities in cold storage. Pears and peaches that ripened quickly after picking, and which are stored for a short time only, were found to keep much better in a temperature not exceeding 32° than in a temperature of 36°. The best results were obtained by storing them in open packages in which there was a free circulation of air, which quickly reduced the temperature of the fruit. Winter apples, on the other hand, intended to be kept for a long period, kept better in a closed package, which prevented evaporation from the fruit.

COLD CURING OF CHEESE.

A series of experiments has been conducted during the last few years at the Wisconsin Agricultural Experiment Station with a view to study the development of cheese flavours under temperature conditions much lower than those hitherto employed.

In the Eighteenth Report of the Station it is explained by the investigators—Professors Babcock, Russell, Vivian, and Baer—that the temperature environment in which cheese is placed during the ripening period is known to exert a most important effect on the quality and, therefore, on the value, of cheese Practical experience has shown that the poorly-

constructed curing-room, in which the daily temperature variation follows quite closely that of the outside air, is not suited to the development of the most desirable flavour of cheese. In such rooms, where the temperature often reaches 80° Fahrenheit, or above, the cheese ripens very rapidly, and acquires not only a poor texture but also a rank, sharp taste, which is not acceptable to the general market. The failure to recognise the importance of controlling this factor of temperature costs the cheese industry of the United States of America large sums every year, out of all proportion to the cost of maintaining a suitable temperature control.

The first experiment was intended to show the effect of low temperatures on the activity of galactase. Two cheeses were kept at a temperature below freezing (25° to 30° Fahrenheit) for fourteen and seventeen months respectively, and then analysed. In the second series of experiments, cheeses were made with three, six, and nine ounces of rennet per 1,000 lb. of milk, and cured at temperatures of 15°, 33°, 40°, 50°, and 60° Fahrenheit. In the third series, cheeses were made with three ounces of rennet per 1,000 lb. of milk, and cured at temperatures of 15°, 40°, and 60° Fahrenheit. In the fourth series of experiments, milk was obtained from different regions, and a larger number of cheeses were made. The curing temperatures were 15°, 40°, 50°, and 60° Fahrenheit.

The results obtained led the authors to believe that lower temperatures than usual may be employed with perfect safety in the curing of cheese. The experiments showed not only that no bitter or other undesirable flavour was produced, but that the quality of the cheeses cured under these conditions was, on the whole, better than that of those ripened at the more usual temperatures employed (60° Fahrenheit and above). Good results were obtained at all temperatures from 33° to 50° Fahrenheit; with more uniform results from 40° to 50° Fahrenheit. The experiments showed that the course of ripening is not normal at temperatures below freezing, and they cannot be recommended for general practice, although the casein of cheese breaks down even under these low-temperature conditions.

The above conclusions have been confirmed by further

experiments which have been made by the same investigators at the Wisconsin Experiment Station, and published in a recent bulletin. The results indicate that cheese cured at temperatures of from 33° to 50° was superior in flavour, commercial value, keeping qualities, &c., to the cheese cured at 60°, and that the losses due to mould and shrinkage were much less. The authors state that while the cold-cured cheese is exceptionally mild in flavour, even when a year or more old, it is possible to subsequently develop almost any degree of flavour desired by exposing the cheeses to higher temperatures (60° Fahrenheit) for varying periods of time after they have been thoroughly broken down under cold-curing conditions. The danger of developing abnormal or undesirable flavours is much less in this subsequent treatment than it is where the green cheese is held for a period at high temperatures. In cold-cured cheese it is permissible to use much larger amounts of rennet than can be safely used in cheese cured at 60° Fahrenheit or above. This increase in rennet hastens the course of ripening and has a tendency to make the cheese more open in body, but even with two or three times the normal amount of rennet the flavour of cold-cured cheese is still clean and mild, and the texture smooth and silky.

The advantages and disadvantages of cold curing were also considered from a commercial standpoint. It is inferred that cold curing of cheese cannot well be applied to the handling of the product of a single factory, as it entails the use of refrigeration (natural or mechanical) to secure the desired temperatures. A properly insulated and equipped cold-curing station could, however, be constructed by means of co-operation between a number of contiguous factories. One great advantage of a curing station is that the factories where the cheese is actually made may be of the simplest construction, and do not need any provision for curing, as the product should be sent every few days to the central curing station. Numerous other advantages accrue from this method of handling cheese, all of which tend to lower the cost, such as the lessened expenses of buying, carriage, &c., while at the same time the product is better, more uniform, and of much better keeping quality.

CARRION BEETLES.

In July last the Board received from Scotland specimens of beetles which were found to be very numerous in a turnip field, although they were not definitely stated to be feeding on the plants. They proved to be one of the Carrion Beetles (*Silpha rugosa*), closely related to the two Beet Carrion Beetles (*Silpha opaca* and *S. atrata*). Both the latter species are injurious to mangolds, the larvæ eating the leaves and stem, and often destroying a crop entirely. *Silpha rugosa* nearly always occurs with them, and is probably the commonest member of the genus; but there is no record of this species doing any harm to crops, as in the case of the two closely related species.

The larvæ and also the adults of the *Silphidae* are normally carrion feeders, numbers of these three species being usually found in June in and under any dead carcase lying about in the fields. But the two species *S. opaca* and *S. atrata* frequently abandon their carnivorous habits and attack mangolds and beetroots. Canon Fowler also records finding the larvæ of a number of this genus on the roots of plants in the Isle of Wight. It is therefore possible that *S. rugosa* may sometimes become vegetarian in habit. Miss Ormerod mentions the Beet Carrion beetle (*S. opaca*) as occurring also on the potato, and devouring spurrey, so that it is possible that *S. rugosa* may similarly attack various plants and not one in particular.

The larvæ of *S. rugosa* are moderately broad, with the edges of the thoracic (*i.e.*, first three) segments rounded, those of the remaining segments projecting. The body ends in two processes called *cerci*, which in this species are long—at least three times as long as the anal process between them. The head is large and projecting. When full grown, which is usually by the middle, but sometimes not until the end of July, the larvæ bury themselves in the soil to a depth of from three to four inches, and turn to pupæ. In three to four weeks the beetles appear from the pupæ, and these beetles apparently live through the winter.

As there seems to be a possibility of these carrion feeders becoming destructive, it may be advisable to take steps to clear turnip fields, where they are numerous, of these insects. For

this purpose the best method would be to employ natural traps in the form of dead birds or small mammals scattered over the ground here and there. The dead bodies attract the beetles and larvæ, which can be shaken out into pails of hot lime and so destroyed.

ROSY RUSTIC MOTH.

The Board have received from two localities in Lancashire specimens of potatoes which had been injured by the larvæ of the Rosy Rustic Moth (*Hydraecia micacea*) tunnelling up the stalks. This is a new potato pest, and should it prove to be abundant it might become troublesome, as remedies, except hand-picking the attacked haulm, are out of the question. These caterpillars have been recorded feeding on the stems of *Equisetum*, dock, and valerian, but probably attack a number of other plants. Maturity is reached in July, and the larvæ then pupate in an earthen cocoon or cell in the ground, the moth emerging in August. The moth, which is very common in gardens and lanes in most parts of England, occurs also in Scotland.

THE GREEN ROSE CHAFER.

Reports were received last year by the Board of damage caused to beans and currant bushes in Gloucestershire by the Green Rose Chafer (*Cetonia aurata*).

This beetle is generally distributed in the South and West of England, and occurs plentifully in the Midlands, but becomes rarer in the North. It is usually common in Gloucestershire, so that it is not surprising that it now and then occurs in such numbers as to become a serious pest. The beetles attack all kinds of flowers and also the leaves; it is especially injurious to the rose, apple, and strawberry. It is also recorded as damaging turnips for seed. When attacking blossoms the beetles seem to

mainly devour the anthers and thus destroy the crop. They are very frequently found in peonies and on the elder; they also destroy this blossom at times very severely. These brilliant beetles fly readily in bright sunshine, but become very sluggish during dull, damp, and cold weather.

The beetles appear from the middle of May and on through June. They lay their eggs in the ground, seeking out some crack or crevice into which they crawl. Heaps of rich earth, such as cucumber beds, vine borders, are favourite places for them to lay their eggs. These soon give rise to white grubs, very like those of the cockchafer, from which they differ by having a deep reddish-brown spot on each side of the first thoracic segment; the legs are also longer than in the cockchafer grub, and the whole surface is clothed with transverse rows of reddish-brown hairs.

The larvæ also may be found amongst rotten and rotting wood, but mainly in rich soil. Their food consists chiefly of the roots of various plants, and probably of decaying vegetable matter as well. When mature they attain the length of an inch and a half, taking from two to three years to reach maturity. The pupal stage takes place in an earthen cell, over an inch in length, deep in the ground, the outer part of the cell being rough, the inner smooth. The pupa is of an ochre colour. The grubs apparently pupate in the summer, and the beetles appear from these in the following May and June. Canon Fowler notes that the larvæ and perfect insects are often found in ants' nests.

By far the most successful way to cope with these large sluggish beetles is by "hand-picking." This should be done during dull weather, when they are very quiet; on warm days they become more active and fly about.

Heaps of leaf mould, cucumber beds, and heaps of decaying wood should be examined when turned over or moved, and the grubs hand-picked. Old tree stumps frequently harbour them, and should thus be grubbed up in the winter and burnt. In garden and field cultivation, poultry do much good if turned on when the land is being broken, greedily devouring these larvæ as well as the chafers.

"Turf-traps"—*i.e.*, heaps of rotting turf, may be left here and

there about in the garden to attract any stray beetles to deposit their eggs. These heaps can be examined in the winter and all the grubs burnt.

THE RED BUD-CATERPILLAR.

(*Hedya oecallana.* Tr.)

Several lepidopterous larvæ inhabit the buds of fruit trees; the most abundant of these is one known as the Red Bud-Caterpillar. The winter moth larvæ also feed inside the buds of fruit trees to some extent, but not until the buds are quite ready to burst.

The Red Bud-Caterpillar is found on all fruit trees, but prefers the apple, plum, and cherry. The moth is found flying about the trees in May, June, and July, and deposits its eggs on the leaves. It is about one-half of an inch across the expanded wings. The fore wings are grey, with a broad white transverse band studded with grey spots across the middle from one edge to the other. The larvæ hatch in the summer and feed upon the leaves, and pass the winter in little cases on the trees. In the spring they enter the buds and leaf-tufts. When full grown they pupate amongst the dead buds or amongst the leaves near. From the pupæ the moths may make their appearance during the end of May, but usually in June and July. It is particularly destructive in nursery stock, for it is usually the terminal buds that are attacked, and so the leading shoots are destroyed and the tree becomes deformed.

Prevention.—Trees that have been previously attacked should be well sprayed in the autumn, and prior to the buds bursting in the spring, with Paris green or arsenate of lead. Most of the larvæ would then be destroyed by eating the poison either in the leafage or in making their way into the buds.

Several other *Tortrices* also live in their larval stage inside the buds of various fruit trees and bushes, but do nothing like the harm caused by the one dealt with here.

THE APPLE-SHOOT BORER.

(*Laverna atra.* Haw.)

The maggot that so frequently bores into the apple shoots is the larva of a small moth known as the Apple-shoot Borer or Pith Moth (*Laverna atra*). The damage done by this pest is very severe in some seasons in many parts of Great Britain. The young shoots attacked by the larvæ are completely destroyed, and can readily be seen by their dying away during the early part of the summer. The flagging shoots may be noticed as early as the middle of May, but show themselves most prominently during the early part of June.

Like most bud-larvæ and borers, their presence is not detected until the damage is done, so that remedial measures are out of the question. The grubs live through the winter hidden under the rind of an old twig or the base of a bud in a semi-mature condition. In the spring they commence to work again with renewed energy, and tunnel up the twig. The larvæ also live in hawthorn berries, and are of a dull reddish hue; those that are found in the apple shoots are duller in colour, some almost brown; the head is deep brown, and so are the last two segments, and some specimens, especially if put in spirit for a short time, show two oval deep brown patches about the middle of the body. The whole body is more or less hairy and has the normal number of legs, namely, six jointed ones and four pairs of median pro-legs. In length the mature larva reaches about one-third of an inch.

The caterpillar reaches its full fed stage from the second week to the end of June. Pupation takes place inside the dead or dying shoot. The moth emerges in the latter part of June and in July. The moth is six lines (*i.e.*, half an inch) across the expanded wings; the fore wings are black, the inner margin is white to beyond the middle, the white passing on as an irregular streak towards the tip, two branches from which intersect the black apical portion of the wing; the hind wings are grey, with pale fringes, and the head more or less white. Some specimens have the front wings almost entirely black. The adults may be found flying about in the hedgerows, in gardens and orchards. It is apparently only single brooded.

Preventive measures.—All that can be done is to cut off all the diseased shoots early in June, before the moths have appeared, and so prevent them from increasing, and to spray in autumn with arsenites.

DESTRUCTION OF MUSTARD BEETLE.

The Mustard Beetle (*Phædon betulae*) can be materially lessened by various methods. The beetles pass the winter in a torpid condition in any shelter where they have been working in the summer and autumn. The larvæ hatch from eggs laid in the spring upon various plants. The beetles which deposit their eggs have frequently passed the winter in hollow stems of reeds along the dykes and ditches of the district, and also commonly in the hollow mustard stocks left about in and around the fields, and in the mustard stubble. They also winter in mustard stacks, cracks and crevices of gates, posts, fences, rough grass, and all manner of places.

The larvæ when mature pass into the ground to pupate, in which stage they remain from two to three weeks; the beetles coming from these pupæ at once attack the mustard plant. The beetle is found practically all the summer; it is therefore probable that there is more than one brood every year. The eggs laid in the spring are placed on all kinds of cruciferæ; the larvæ feed upon the leaves; they are dull, smoky-yellow creatures, slightly hairy and spotted with black, with black head and six black legs; there is also a distinct caudal foot and a row of curious tubercles along each side from which can be protruded curious yellow glands; when mature they reach about three-fourths of an inch. These larvæ can be easily seen on the leaves, and are vulnerable at this stage.

Preventive and Remedial Measures.

All precautions should be taken to destroy as much winter shelter as possible. After a bad attack it would be advisable to burn the mustard straw, not at once, but after it has been allowed to stand some time in heaps in the fields; the beetles

would seek winter shelter there, and on firing the heaps would be destroyed.

All hedge trimmings, and reedy growths along dykes, should be cut and burnt during the winter. Sufficient experiments on a large scale do not seem to have been as yet made in destroying the larvæ upon the young plants when it is possible to get on the land. There is no doubt that the proper time to attack this pest is in its larval stage when feeding upon the young leaves. The fields should then be sprayed by means of a horse strawsoniser with Paris-green wash ; the time to carry out this operation would depend upon the time the small grubs are noticed on the leaves.

The beetles also attack the young leaves, and would also be destroyed by the same wash. The beetles may also be collected when present in numbers on the young plant by dragging a long strip of tarred sacking attached to a light rod over the field and also by special machines. The beetles which attack the crop later on in the year may be kept in hand by preventing their movements from place to place. Towards the latter part of the year, when so much damage is reported, the beetles do not seem inclined to use their wings, but migrate in a body along the ground from field to field. They can thus be held up like locusts by cutting a trench across their line of march, or by burning damp straw so that the smoke blows on to them. The employment of a shallow trench about a foot deep is the best plan to check them, especially if it can be filled or smeared repeatedly with tar.

It is also important to keep horse hoeing as long as possible between the rows ; by this means the pupæ are turned out of the earth and are exposed to the attack of various birds. Mustard should always therefore be drilled far apart when grown for seed ; more than a foot should be allowed between each row. Not only can the crop then be easily horse hoed, but special machines can be taken across the fields between the rows to catch the beetles. Wooden scoops, with tar or soft soap smeared over the insides, may be arranged so as to be pulled through the field either by hand or horse power and so collect the beetles.

The early spraying with some arsenical wash so as to kill the larvæ and beetles, is, however, most to be recommended.

BROWN ROT OF FRUIT.

(*Sclerotinia fructigena.* Schröter).

This is undoubtedly one of the most general, and also the most destructive of diseases against which the fruit grower has to contend. It attacks apples, pears, plums, cherries, peaches, and is also not uncommon on various wild fruits belonging to the order *Rosaceæ*, as bullace, crab, etc.

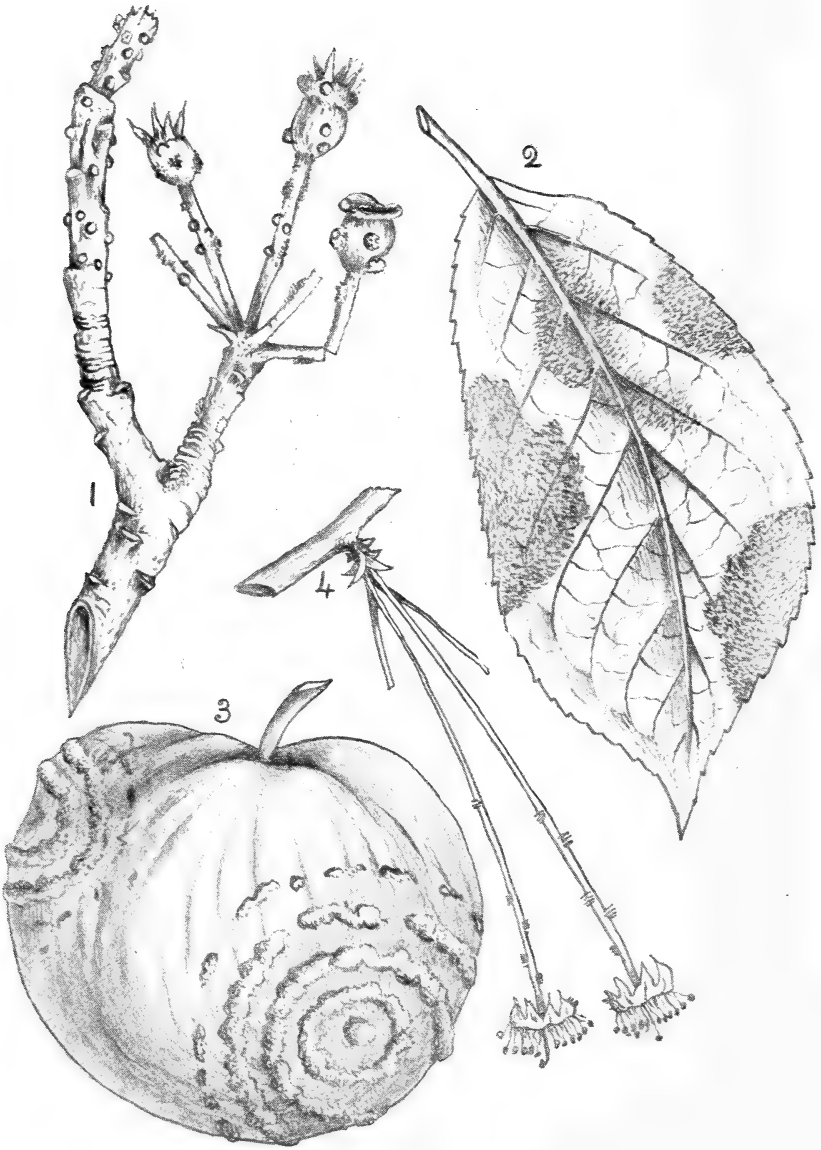
To the ordinary observer this disease first attracts attention when it appears on the fruit under the form of brownish scattered patches on the skin. This is followed by the growth of dull grey tufts (the so-called *Monilia* fungus), which are usually arranged in irregular concentric rings. These grey tufts are composed of dense masses of spores arranged in long branched chains.

The fairy-ring arrangement of the fungus is most evident on apples and pears; on plums, cherries, and stone fruit generally, the grey tufts are irregularly scattered over the surface.

Although most obvious on the fruit, the fungus usually first attacks the leaves, where it forms thin, velvety, olive-green patches. The spores from diseased leaves are washed by rain, or carried by insects on to the surface of the young fruit, or not infrequently the flowers are also inoculated from spores derived from young leaves; and in many instances where brown and shrivelled blossoms are attributed to the action of a late frost, the true cause is in reality due to the *Monilia* fungus.

In those instances where the disease has been allowed to follow its course undisturbed for some years, the young shoots of the trees are also attacked and killed during the first or second year. The fungus develops rapidly on such dead twigs, and furnishes a ready supply of spores, which are mature during April and May, just when the young leaves and blossom are most susceptible, and wholesale infection results.

Fruit attacked by this disease does not rot and decay, but becomes dry and mummified. Such fruit often remains hanging on the tree until the following season. Whether it does so or falls to the ground, it is practically unchanged until the following spring, when its entire surface becomes covered with a



Brown Rot of Fruit.

copious crop of spores, which are dispersed by various agencies, and the disease repeats itself.

It has long been suspected that the *Monilia* represented but one stage in the life-cycle of the fungus; this supposition has proved to be correct, the second or ascigerous form of fruit having been found growing abundantly on old half-buried peaches in several orchards in different parts of the United States, where the fungus proves quite as destructive as with us.

Preventive Measures.

All dead twigs and shrivelled fruit, whether hanging on the tree or lying on the ground, should be collected and burned during the winter.

After the diseased fruit and dead branches have been removed, the trees and also the ground should be thoroughly drenched with a solution of sulphate of iron, prepared as follows:—

Sulphate of iron	25 pounds.
Sulphuric acid	1 pint.
Water	50 gallons.

Pour the sulphuric acid upon the sulphate of iron, then add the 50 gallons of water by degrees. A barrel is the best vessel to use; a metal vessel must not be used, as it would be acted upon by the sulphuric acid.

Spraying with the above solution should be done in January or February, before the leaf-buds begin to swell in the least, otherwise the foliage and blossom will be destroyed.

When the leaf-buds are expanding, and at intervals as required, the trees should be sprayed with quite weak Bordeaux mixture.

The above line of treatment must be followed for at least two seasons.

Explanation of the Figures.

1. A diseased shoot with the persistent blossom of the previous year; cut from the tree in February. Both twig and flower-stalks bear tufts of the fungus. Nat. size.
2. Cherry leaf attacked by the fungus. Nat. size.
3. An apple recently attacked, and showing the fungus growing in concentric rings. Nat. size.
4. Fresh cherry blossom attacked by the fungus. Nat. size.

PREPARATION OF WOOL FOR MARKET.

In view of the great competition in the trade in wool, it is important that flock-masters and others should continue to pay attention to the cleanliness and packing of fleeces before sending them to market. The following suggestions bearing on these points have been drawn up in consultation with the Bradford Chamber of Commerce.

Washing and Shearing of Sheep.

In all districts where sheep are washed other than by the tub-washing process, the sheep should be washed without any artificial assistance, that is to say, in cold water without any soap except the natural soap which exudes from the skin in sufficient quantity at the shearing period.

The sheep should not be allowed to run too long after washing before being sheared, as this in effect brings the wool back into greasy condition. Nor should they be clipped, or the fleeces wound, while wet, as this takes away the liveliness from the fibre and causes the wool to rot.

The shearing should not be performed in dirty places such as barns littered with chaff and straw and other matters which get into the wool and cause much trouble and annoyance. The cost of this fault to the dealer and manufacturer is far more serious than flock-masters think, as it is often impossible to get this foreign matter out without the use of chemicals, which further spoil the wool.

When the fleece is wound no earth or dung should be left on the fleece, or be allowed to get in whilst winding. No locks, tailings, skin wool, black or cots should be wrapped up inside fleeces, neither should greasy wool be wrapped up inside washed fleeces.

Tar-Branding oj Sheep.

Tar should not be used where it can be avoided for marking sheep. A large quantity of wool used for manufacturing purposes does not undergo the process of sorting, and thus it frequently happens that in spite of efforts to remove tar-marked wool some of the tar passes into the finished goods, thereby causing considerable damage and loss. Even when the wool is sorted it is very difficult to entirely eliminate the tar.

As tar is not dissolved in the ordinary processes of wool-washing, flock-masters should endeavour in cases where its use cannot be avoided to improve the methods of applying it, either by making use of smaller marks or by adopting means to prevent the tar from running. If practicable, marking on the ear or face is much to be preferred.

Methods of Tying Fleeces.

The fleeces should be tied up with bands made by twisting a portion of the fleece itself. It is not necessary for these bands to be tightly twisted, the object being merely to keep one fleece separate from another. String composed of vegetable matter, such as hemp, jute, &c., is bad, and ought not to be used. The most careful manipulation by the manufacturer often fails to detect some small pieces of string, which do not make their appearance until the cloth is dyed, because vegetable matter absolutely refuses to take dyes used for wool. Dress goods and cloths are often damaged in this way to a very considerable extent. Most farmers tie up their fleeces with wool bands, and have done so for generations, except in a few western and southern counties. In the latter the use of string (and frequently the worst kind of string, such as reaper or binder twine) is not uncommon. This use of string is unprofitable to all the parties concerned. The amount of damage done is a very serious matter to the manufacturer, and the district from which such wool comes suffers in reputation.

Dips.

In the selection of dips care should be taken to use only those that do not stain the wool.

MARKETS AND FAIRS (WEIGHING OF CATTLE) ACTS.

The Board of Agriculture have recently issued the following circular relating to the Markets and Fairs (Weighing of Cattle) Acts, 1887 and 1891 :—

Great Britain.

1. The Markets and Fairs (Weighing of Cattle) Acts, 1887 and 1891, require that in or near every Market or Fair in which tolls are for the time being authorized to be taken, and actually

are taken, in respect of cattle, sheep or swine, by "the Market Authority," that is, the company, corporation, or person who takes such tolls, the Market Authority shall provide and maintain to the satisfaction of the Board of Agriculture sufficient and proper accommodation for weighing animals, unless exempted by the Board from the provisions of these Acts.

2. These Acts also provide that auctioneers shall not, unless exempted from the provisions of the Acts by the Board, sell cattle, sheep or swine at any mart where such stock are habitually or periodically sold, unless similar weighing facilities are provided thereat.

3. When accommodation for weighing animals is being provided at a market, fair, or mart, the following considerations should be kept in view, namely:—

(*a.*) the convenience to buyers and sellers of the proposed situation of the weighing machine;

(*b.*) the supply of proper pens for keeping the animals together both on entering and on leaving the machine; and

(*c.*) The size of the proposed machine and its capacity for weighing at the same time, if required, a sufficient number of store or fat animals so as not to delay unduly the business of the market, fair, or mart.

In cases where it is proposed to provide weighing machines, it is desirable to communicate beforehand with the Board as to the sufficiency of the proposed accommodation.

4. The accuracy of the weighing machine and weights must be tested at least twice in every year by the local Inspector of Weights and Measures.

5. Exemption from the requirements of the Acts may be granted by the Board on the ground that the sale of cattle, sheep and swine at the market, fair, or mart is, or is likely to be, so small as to render it inexpedient to enforce the provision of weighing accommodation. Application for such exemption should be made in the form provided by the Board for the purpose.

(Signed.) T. H. ELLIOTT,
Secretary.

Board of Agriculture,
4, *Whitehall Place, London, S.W.*
February, 1903.

PREVENTION OF WHITE SCOUR AND LUNG DISEASE IN CALVES.

The Irish Department of Agriculture and Technical Instruction have issued a further leaflet on the procedure to be followed in the prevention of white scour and lung disease in calves. In this leaflet the following measures are recommended:—

The floors of cow-houses and calf-houses should be thoroughly cleaned and disinfected at least once each week with a solution of blue-stone (2 lb. blue-stone to every 3 gallons of water required). The floor of the calf-house should be of concrete, and must be swept daily and disinfected with a solution of blue-stone of the above strength.

When the cow is about to calve place a good layer of clean fresh hay or straw behind her to keep the calf clean.

When she shows signs of calving her "bearings" should be washed with a warm 2 per cent. solution of lysol in rain-water. The same warm solution of lysol should be injected into the passage through which the calf is to be born.

The navel cord should be tied immediately at the birth of the calf with twine which must be kept ready in a solution of lysol. The person who is to tie the cord should first scrub and wash his hands in a solution of lysol.

Immediately the cord is tied the portion adhering to the calf and the surrounding area must be well painted with a solution of iodine in methylated spirits (35 grains iodine to 2 pints methylated spirits).

After a few minutes the navel cord must be painted with a layer of collodion containing 1 per cent. of iodine, or Stockholm tar may be used for this purpose instead of collodion and iodine.

Navel treatment without repeated and absolute disinfection will NOT be successful.

Newly-born calves must be placed in a spot which has been freshly disinfected. Carbolised sawdust will be found a useful litter.

Healthy calves should not be housed or fed with those that are diseased.

Do not feed separated milk till the calf is four weeks old. The change from new to separated milk should be gradual. Give the calf a substitute for the cream removed by the separator. One to two oz. per day of the best cod liver oil, or a mucilage prepared by steeping flax seed or good linseed cake in hot water, will be found useful for this purpose, if the quantity is carefully regulated in accordance with the state of the bowels.

The Main Point in Prevention is Disinfection of the Premises. Half measures will not be effective.

TRANSVAAL REGULATIONS AS TO IMPORTATION OF LIVE STOCK.

The *Transvaal Government Gazette* for January 16th last contained regulations regarding the importation of stock into the Transvaal, which are to come into force on the 1st May next. On and after that date, no stock can be imported into the Colony except through certain points of entry appointed by the Lieutenant-Governor, and the animals will be detained at the point of entry until they have been examined by an official inspector, and he has given a certificate that entry may be allowed.

Healthy cattle not intended for slaughter must be inoculated by an officer appointed for that purpose against rinderpest and pleuro-pneumonia, or such other contagious disease as may be decided by the Director of the Department of Agriculture, and all cattle must be dipped as a precaution against red-water. No cattle coming from a country in which bovine tuberculosis exists will be admitted into the Colony unless the owner or person in charge consents to their being tested with tuberculin, or produces a satisfactory certificate that the cattle have been so tested and have been found to be free from the said disease.

No stock coming from a country infected with foot-and-mouth disease will be admitted except with the permission of the Director of Agriculture, who may also prohibit the entry of all stock liable to glanders or farcy unless the owner or person in

charge permits them to be tested with mallein. The entry of sheep and goats may also be prohibited unless they have been dipped in such manner as may be prescribed.

GEOLOGY OF THE ISLE OF MAN.

One of the most recently published Memoirs of the Geological Survey of the United Kingdom deals with the Geology of the Isle of Man, price 12s.

The Isle of Man is one of the few remaining portions of the kingdom which have not previously been brought under the operations of the Geological Survey in any form. The present Memoir is the outcome of the survey of the island by Mr. G. W. Lamplugh, F.G.S., and is a very full explanation of the geological maps of the island, which are issued in two editions, with and without drift. Besides the chapters of topographical details regarding the rocks of the island, which are arranged to serve as a geological guide book to those in search of local information, the work contains general chapters in which a broader method of treatment is adopted and prominence is given to the phenomena of more than local interest. Thus, the descriptions of the physical features of the island, of the "crush-conglomerate" and other curious rock-structures and types of folding produced by earth-movement in the Manx slates, of the disturbances of a different character exhibited by the carboniferous rocks, of the structure of the Irish Sea basin as revealed by deep borings in the north of the island, and of the condition of the island during the successive stages of the glacial period; all contain matter of wide geological interest. The chapters on the petrography of the great variety of igneous rocks, and of the sedimentary rocks of the island, have been prepared by Prof. W. W. Watts, F.G.S.

Under the heading of Economic Geology, there is a general account of the metalliferous veins in the island, and a careful description of the numerous mine-workings and trials that have been carried out in exploiting or testing these veins. The book is illustrated by numerous plates, figures and sections.

MANUFACTURE OF OLEO-MARGARINE, OLEO-OIL, AND FILLED-CHEESE IN THE UNITED STATES.

The manufacture of oleo-margarine in the United States has greatly developed of recent years, the largest output in any year since 1886 being that for the fiscal year ended 30th June, 1900, which amounted to 107,000,000 lb. This represented an increase of about 29 per cent. over the production in 1899, 86 per cent. over that of 1898, and 135 per cent. over the product of 1897. The production decreased slightly in the year ended June 30th, 1901, when 105,000,000 lb. were manufactured. Illinois produces more oleo-margarine than any other State, its output in 1901 exceeding 42,000,000 lb., or 40 per cent. of the total for the country; Kansas occupies the second place, while Ohio and Rhode Island rank third and fourth respectively. In the fiscal year 1901 there were 32 manufacturers, 194 wholesale dealers, and 9,849 retailers of oleo-margarine in the United States, or double the number recorded in each case for 1898.

The exports of oleo-margarine from the country in 1901 amounted to 5,000,000 lb., as compared with 4,256,000 lb. in 1900, and 5,549,000 lb. in 1899. The West Indies furnish the chief outlet for exported oleo-margarine, those islands having taken more than half the quantities sent out in the fiscal years 1900 and 1901. Over 1,200,000 lb. were shipped to Germany in 1901, this total representing a large increase over the quantity in 1900 but less than in 1899. The next best customers in 1901 were British South Africa and British Guiana, to which countries 238,000 lb. and 183,000 lb. respectively were sent, while the exports to the United Kingdom only amounted to 149,000 lb., or less than half the quantity for 1899.

The exports of oleo-oil amounted to 147,000,000 lb. in 1900, and 162,000,000 lb. in 1901, these figures showing a small increase over preceding years. As usual, the Netherlands furnished the principal outlet for this product, taking 85,000,000 lb. in 1901 or rather more than in the preceding year. The exports to Germany amounted to 33,482,000 lb., this being an increase of 7,000,000 lb. on the total for 1900. The shipments to Denmark, Scandinavia, and the United Kingdom have shown large increases during the past three years. The quantities sent to

those countries in 1901 were 11,735,000 lb., 17,060,000 lb., and 9,558,000 lb. respectively.

The production of filled-cheese in the States decreased in 1900 and 1901. The output in the latter year was 1,305,000 lb., or less than for any year since 1896, practically the whole of the output being for export. In 1901, only eight establishments were reported to be handling filled-cheese, including manufactories in Illinois, two retail establishments in Maryland, and one retail establishment in Louisiana.

[*United States Department of Agriculture: Annual Report of the Bureau of Animal Industry for* 1901.]

UNITED STATES MIXED FLOUR LAW.

The manufacture and sale of mixed flour in the United States is regulated by an Act which passed the Federal Legislature in 1898. Mixed flour, within the meaning of the Act, is the food product made from wheat mixed or blended in whole or in part with any other grain or other material, or the manufactured product of any other grain or other material than wheat. The Act requires every person, firm, or corporation engaging in the business of making, packing, or re-packing mixed flour, to pay a special annual tax. All packages must be plainly branded or marked with the words "Mixed Flour," together with the true weight of such package, the names of the ingredients composing the same, the name of the maker or packer, and the place where made or packed. A card, on which similar information is printed, is also required to be placed in each package. The barrels or other packages in which mixed flour is packed must not contain more than 196 lb., and upon each package a tax is payable by the manufacturer or packer, varying according to the weight, the tax being represented by a coupon stamp affixed to the package. All sales and consignments of mixed flour must be in packages not before used for that purpose, and packages or labels must not be used a second time or the contents removed without destroying the revenue stamp thereon. All mixed flours imported from foreign countries must, in addition to any import duties

imposed thereon, pay an internal revenue tax on each package, represented by coupon stamps, the packages being marked as in the case of mixed flour made or packed in the States. Mixed flour may be removed from the place of manufacture or from the place where packed for export without payment of any tax or affixing stamps or labels thereto; but every such package must be branded or marked with the same particulars as are required in cases where the product is intended for home consumption.

[*U. S. Department of Agriculture, Bureau of Chemistry, Bulletin No.* 69, *Part I.*]

UNITED STATES FRUIT-CANNING INDUSTRY.

The process of preserving food by the application of heat and its isolation from contact with the air was first discovered in 1795 by Nicholas Appert, a Frenchman. His method was to enclose fruit in a glass jar, which was then corked and subjected to the action of boiling water for a time, varying according to the nature of the article treated. The glass jars were, however, gradually abandoned in favour of tinned cans. By the Appert process, the receptacles containing the food were heated in open kettles, the highest temperature obtainable by this method being 212 degrees Fahrenheit, or the temperature of boiling water. Improvements were subsequently made in the methods, and a higher degree of temperature was obtained by the addition of common salt to the water. This innovation was followed by the use of chloride of calcium, which made possible a temperature of 240 degrees Fahrenheit. In 1874 an American invented a closed-process kettle to cook the goods by superheating water with steam. About the same time another American invented a patent-process kettle which secured the same results by the use of dry steam. By these methods, which are used at the present time, any desired temperature can be obtained and the heat regulated to meet requirements.

Although the canning industry was established in three great commercial centres in the United States as early as 1825, it did not become of much importance until within the past quarter of

a century. The canning and preserving of fruits and vegetables had its inception in the country prior to 1850, but the Census of 1870 was the first which contained statistics of the industry. In that year there were 97 fruit and vegetable canning establishments in the States, employing 5,869 persons. The number of such establishments had increased to 1,808 in 1900, while the number of persons engaged in the industry had risen to 38,142. The capital employed amounted to £482,000 in 1870, and in 1900 a total of £5,780,000 was reached. During the same period the yearly value of the products advanced from £1,130,000 to £11,806,000; but the average value of the product per establishment fell from £11,650 in 1870 to £6,530 in 1900. This decrease is accounted for by the great number of establishments employing small capital which have become engaged in the industry since 1870, as well as by the great diminution in the cost of production brought about by the introduction of machinery into every detail of the business, both in the making of cans and in the preparation of the product. Since 1883 machines have been used for practically all operations in the manufacture of canned goods, and to-day, even the labelling, trimming of labels, and the boxing of goods are performed by mechanical devices run by steam or electric power.

[*United States Census Bulletin*, *No.* 209.]

ITALIAN MARKET FOR BRITISH FERTILISERS.

H.M. Consul at Venice states in his recent annual report that the Italian Minister of Agriculture last season addressed a circular to the Prefects enjoining them to warn landowners not to buy artificial manure offered by travellers under the inducement of saving the expense of the analysis, or of purchasing on credit, as such manures are deficient in soluble and fertilising elements, and are therefore of little value to agriculture. The Minister added that a fraud is thus committed upon agriculturists, and a distrust is created against superphosphates, with a consequent delay in their use.

There are now several manure factories in Italy, but the British superphosphates are considered superior, and con-

tinue to be imported. H.M. Consul, who offers to render any assistance in the matter, states that a good plan would be for British manufacturers of superphosphates to send samples of their produce to the agricultural committees through a responsible person on the spot, with an exact analysis, and then forward consignments, against bills if required. He has no doubt that in this way orders would be obtained.

[*Foreign Office Report, Annual Series, No.* 2,935. *Price* 1½*d.*]

Import Duties in Costa Rica.

According to information received through the Foreign Office, the Legislature of Costa Rica has recently passed a Decree, revising the scale of duties charged on various articles of food imported into the Republic. The new tariff, which came into operation on January 1st, last, fixed the duty on beans and cheese at 8 cents, on lard and bacon at 10 cents, on butter at 30 cents, and on salt at 6 cents per kilogramme (2·2 lb.) In the case, however, of rock salt imported through Limon for the use of cattle, no alteration was made in the rate of 2 cents per kilogramme. In 1904 the duty on lard and bacon is to be raised to 15 cents; while on and after January 1st, 1905, the duty on these articles will be levied at the rate of 20 cents per kilogramme. The new tariff will apply to substitutes for beans, lard, bacon and butter, as well as to the genuine articles.

The Decree further authorises the Executive to import hogs and sows of superior breeds, and to sell them by auction to the farmers.

Teazels in the United States.

Teazels have for many years been grown to good profit in Clackamas County of Oregon State. They are used to some extent by manufacturers of cloth to raise a nap in the cloth, though steel points are used in American mills in place of teazels for the coarser cloths. Skaneateles, New York, is the

only other place in the United States where the teazel is grown, the New York variety being rather larger than the Oregon product. It costs about 2d. per lb. to grow and prepare teazels for the market, and they sell at an average price of 4d.

[*Foreign Office Report, Annual Series, No.* 2,858.]

Artificial Manures in Russia.

H.M. Consul at Kieff reports that the Russian farmers of the "Black Soil" country depended entirely upon its natural richness until comparatively recently, when the harvests began to diminish. The farmers therefore adopted the methods taught by various agricultural institutes, and they are already appreciating the advantages of manuring their land; but as it is impossible for them to obtain a sufficient supply of farmyard manure they are using artificial fertilisers as well. The use of artificial manures in the "Black Soil" district of Russia is, however, in its infancy, and the following amounts are quoted as having been employed in 1901: Superphosphate, 6,452 tons; Chili saltpetre, 645 tons; kainit, 484 tons, and Thomas slag, 806 tons. Very little artificial manure is used as yet in the cultivation of winter grain, as the selling price does not leave a sufficient margin; but trials have been made with grain crops, and the increase in the yield is expected to lead to a more extended use of fertilisers in the future. Superphosphate plays a very important part in the cultivation of beetroot in the south-west of Russia; it strengthens the plants during the spring against the ravages of insects, and produces an increase in the size of the roots as well as a greater percentage of sugar.

[*Foreign Office Report, Annual Series, No.* 2,750.]

Cattle Industry in Uruguay.

According to information recently received through the Foreign Office from H.M. Vice-Consul at Paysandu, grass and water were abundant in his district during the past season. Cattle were in fairly good condition. Dry-salting establishments were, however, offering low prices for native cattle, but

special prices were given for improved breeds. Cattle farmers in the district are turning their attention to improving their animals by the introduction of good breeding stock, the Hereford being the favourite breed, although the Shorthorn and the Devon breeds are also being tried.

Agricultural Depression in Italy.

The Foreign Office have recently published a report by Mr. Stephen Leech, Second Secretary to H.M. Embassy at Rome, on the foreign trade of Italy during the year 1901.

The report indicates that the progress which has lately taken place in Italy in industrial enterprise and foreign trade has not extended in the same degree to agriculture. In spite of the increase of population during the past ten years, the production of corn, maize, oil and other agricultural produce has not advanced. Emigration, bad harvests, vine disease, and the concentration of the people in towns may be responsible for this depression, but Mr. Leech states that taxation undoubtedly presses very severely upon the agricultural portion of the population, and Italian legislation has hitherto benefited the industrial section of the nation to a greater extent than the agricultural. The Italian Government is considering important proposals of economic reform with a view to improve the condition of the agricultural classes, especially those of the south, where there is most depression. The legislative programme includes proposals for reduction of the price of salt from 4d. to 2½d. per kilo. (2·2 lb.), the production of which is a state monopoly; the partial abolition of the land tax on small holdings; new agricultural buildings; reafforestation of land; the exemption of grazing farms from income tax; and the provision of fresh water, roads, and railways to the less favoured portions of the country.

[*Foreign Office Report, Annual Series, No.* 2,933. *Price* 3*d.*]

Co-operative Societies in Ireland.

The number of co-operative agricultural societies promoted by the Irish Agricultural Organisation Society amounted, in 1902, to 714, with a membership of 70,000. The total included 248 co-operative dairy societies, 81 auxiliary dairy societies, 125 agricultural purchase and sale societies, 31 poultry societies, 146 co-operative banks, 80 miscellaneous, and 3 federations.

[*The Irish Homestead Almanac*, 1903.]

Duty on Horses Imported into the United States.

In December last the Board of Appraisers at New York decided that horses imported into the United States for breeding purposes, but which were intended by the importer, at the time of importation, for sale, were not entitled to free entry, but were properly dutiable according to value under the provisions of the Tariff. But according to the *Breeders' Gazette*, a Bill was passed by both Houses of Congress, on March 2nd, 1903, which provides that all animals registered in books approved by the Secretary of Agriculture shall be admitted free of duty into the United States, whether they are imported for purposes of sale or not.

HARVEST AND CROP REPORTS.

Crops in the United States.

In the last issue of this *Journal*, a rough estimate was given of the acreage and production of some of the principal crops in the United States last year, based upon preliminary figures which had been published in the November and earlier numbers of the United States *Crop Reporter*. The following table has been compiled from the revised figures which appeared in the December number of the *Crop Reporter* :—

Crop.	Area.	Yield per Acre.	Total Production.
	Acres.	Bushels.	Bushels.
Maize	94,043,613	26·8	2,523,648,312
Winter Wheat	28,581,426	14·4	411,788,666
Spring Wheat	17,620,998	14·7	258,274,342
Oats	28,653,144	34·5	987,842,712
Barley	4,661,063	29·0	134,954,023
Rye	1,978,548	17·0	33,630,592
Potatoes	2,965,587	96·0	284,632,787
		Tons.	Tons.
Hay	39,825,227	1·50	59,857,576

The February number of the *Crop Reporter* gives the number of live stock on 1st January, 1903, as follows :—Horses, 16,557,373 ; milch cows, 17,105,227 ; other cattle, 44,659,206 ; sheep, 63,964,876 ; and swine, 46,922,624.

Crops in India.

The first general memorandum on the wheat crop of India was issued by the Indian Government on the 2nd January last. The following summary is given as to the crop prospects in the various provinces :—In Upper India and the northern half of the Central Provinces the late rainfall was favourable for sowings, and, consequently, they extended over a larger area than in the

previous year, which was exceptionally dry. There were, however, large decreases in Berar and the Deccan districts of Bombay, where the cultivation of wheat is reported to be declining as the result of the unfavourable seasons of recent years; and in Sind, owing to very low inundation, the area was reduced to 28 per cent. below the average. Elsewhere in Bombay, especially in the Gujarat States, there was an improvement, so although the reports were incomplete and sowings still in progress, the total area for the Presidency, including Sind, exceeds by about 100,000 acres the final returns for last year. The condition of the crops was generally good, but rain was much needed throughout Upper India, and the prospects of the crop on unirrigated lands were dependent on its timely arrival.

CROPS IN ARGENTINA.

According to information received through the Foreign Office the wheat and linseed crops in the Consular District of Rosario, Argentine Republic, have given very satisfactory yields this season. A larger area was devoted to maize than usual, and the harvest of this crop, which is now proceeding, is expected to be excellent both as regards quantity and quality. It is estimated that 600,000 tons of wheat, 300,000 tons of linseed, and 1,000,000 tons of maize will be available for export from this district during the current year.

In a later report from H.M. Consul at Buenos Ayres, it is stated that, according to estimates published by the Argentine Ministry of Agriculture, the area sown with wheat in the four provinces of Buenos Ayres, Santa Fé, Entre Rios, and Cordoba in the year 1902-3 was 9,000,000 acres, the production being computed at 3,100,000 tons, while for the rest of the Republic the production is placed at 100,000 tons, making a total product of 3,200,000 tons. The yield of linseed is stated to have been 774,000 tons. The general opinion is, however, that the yields of the crops have been somewhat over-estimated. Wheat is expected to be of excellent quality, but much of the linseed has been damaged and stained by rains at harvest time.

RUSSIAN HARVEST, 1902.

According to information received through the Foreign Office, the Central Statistical Committee of the Ministry of the Interior have published the following estimates of the yields of the leading crops in 1902 in 72 Russian provinces, including 50 Governments of European Russia, 10 Polish Governments, four Caucasian Governments, four Siberian Governments, and four Asiatic Governments, viz. :—Rye, 23,000,000 tons ; wheat, 16,000,000 tons ; oats, 13,000,000 tons ; barley, 7,000,000 tons ; other grain, 6'000,000 tons ; and potatoes, 2,800,000 tons.

CROPS IN BELGIUM.

The *Moniteur Belge* of the 15th December last publishes the following data relating to the yield of the principal crops in Belgium in 1902, the quantities being given per acre:—Wheat, 34·0 bushels ; rye, 32·6 bushels ; winter barley, 49·5 bushels ; spring barley, 40·6 bushels ; oats, 59·6 bushels ; flax, 3·9 cwt. of seed and 4·9 cwt. of fibre ; sugar beet, 11·9 tons ; mangolds, 17·6 tons ; potatoes, 5·5 tons ; clover, 2·5 tons ; meadow hay, 2·1 tons.

CROP PROSPECTS IN FRANCE.

An official report on the condition of the autumn-sown cereal crops in France was published in the *Journal Officiel* of the 19th ultimo.

The acreage under wheat, mixed corn, rye, barley, and oats is given for each department, and the following numerical method is adopted to indicate the condition of the crops ; the figure 100 denotes " very good " ; 80, " good " ; 60, "fairly good " ; 50, " passable " ; 30, " mediocre " ; and 20, " bad."

The annexed table gives the number of departments grouped on the above scale according to the condition of the crop.

Index No.	Wheat.	Mixed Corn.	Rye.	Barley.	Oats.
100	1	1	3	2	3
99 *to* 80	31	31	42	25	27
79 *to* 60	51	35	35	30	32
59 *to* 50	4	3	5	2	3
49 *to* 30	-	1	2	1	2

Mixed corn was not sown in sixteen departments, winter barley in twenty-seven, and winter oats in twenty departments.

THE SWEDISH HARVEST OF 1902.

The official estimate of last year's crops in Sweden indicates that the harvest was one of average yield as regards wheat, rye, potatoes, and hay, and less than the average in the case of barley, oats, and mixed corn. The estimated produce and the decennial average are given below :—

Crop.	1902.	Average, 1892-1901
	Bushels.	Bushels.
Wheat	4,505,600	4,323,000
Rye	22,409,200	21,884,200
Barley	12,586,700	13,576,500
Oats	59,465,500	61,193,300
Mixed Corn	9,643,400	9,102,500
Peas	345,700	1,342,800
Beans	185,600	201,000
Vetches...	295,100	684,200
Potatoes	54,821,800	51,569,900

PARLIAMENTARY PUBLICATIONS.

Agricultural Statistics, Ireland, 1902.—*Report on Irish Migratory Labourers.* [*Cd.* 1375.] *Price* 3*d.*

The number of Irish labourers who sought temporary employment last year at a distance from their homes is given in this Report as 19,176, or 556 less than the corresponding number in 1901. More than three-fourths of this total were natives of the province of Connaught, and of these 10,070 come from the county of Mayo alone, which furnished over one-half of all the Irish migratory labourers. The province ranking next to Connaught in the Returns was Ulster, which furnished 3,033 migrants, of whom 2,453 were natives of Donegal, while Munster contributed 709 and Leinster 636.

The proportion per thousand which the migratory labourers bore to the population of Ireland was 4·3, as compared with 4·2 in 1901. The rates for the provinces of Ulster, Munster, and Leinster were only 1·9, 0·7, and 0·6 per thousand, respectively, but the ratio for Connaught amounted to as much as 22·9 per thousand.

Of the total number of migrants, no fewer than 16,220 were agricultural labourers, while the remaining 2,956 included representatives of the mining, fishing, and other occupations. Most of the labourers, viz., 13,697, were shipped to England, 4,027 went to Scotland, and 1,452 sought employment in other districts of Ireland.

Agricultural Statistics, Ireland.—Extent in Statute Acres and Produce of the Crops for the Year 1902. [*Cd.* 1397.] *Price* 3 *d.*

With the exception of permanent pasture for hay and of mangolds (including beetroot), the extent of land under each of the principal crops in Ireland last year showed a falling off as

compared with the mean for the preceding ten years. The results of the harvest were, however, exceedingly satisfactory, the average yield per acre of all the crops, and the total production of all except three, being above the normal. The following table shows the area, production, and yield per acre of the various crops, with comparative figures for the decennial period 1892-1901 :—

	Area.		Production.		Yield per Acre.	
	1902.	Avera . 1892-1901.	1902.	Average, 1892-1901.	1902.	Average, 1892-1901
	Acres.	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Wheat ...	44,244	50,295	1,601,660	1,580,968	36·2	1·4
Oats... ...	1,082,144	1,181,980	53,800,679	51,727,640	49·7	43·
Barley ...	167,788	168,675	7,941,723	6,439,471	47·3	38·2
Bere... ...	89	213	2,874	6,536	32·3	30·7
Rye	9,638	12,371	252,551	294,013	26·	23·
			Tons.	Tons.	Tons.	Tons.
Potatoes ...	629,304	689,139	2,725,731	2,611,068	4·3	3·8
Turnips ...	288,506	304,124	4,946,774	4,538,810	17·	14·9
Mangold and Beetroot ...	77,144	57,753	1,463,237	934,932	19·0	15·8
					Stones.	Stones.
Flax... ...	49,742	62,456	11,242	11,368	36·2	29·8
					Tons.	Tons.
For Hay—Clover, Sainfoin, and Grasses under rotation ...	603,468	633,600	1,390,853	1,351,319	2·3	2·1
For Hay—Permanent Pasture or Grass not broken up in rotation ...	1,564,996	1,536,761	3,785,777	3,526,926	2·4	2·3

The quantity of honey produced in Ireland in 1901 amounted to 718,218 lb., or nearly double the average quantity for the preceding ten years. Of this total, 188,335 lb. were produced in Leinster, 208,057 lb. in Munster, 197,757 lb. in Ulster, and 124,069 lb. in Connaught.

Committee on British Forestry. [*Cd.* 1319]. *Price 2d.*

This is the Report of a Departmental Committee appointed by the President of the Board of Agriculture to inquire into and report as to the present position and future prospects of forestry, and the planting and management of woodlands in Great Britain, and to consider whether any measures might with advantage be taken, either by the provision of further educational facilities, or otherwise, for their promotion and encouragement.

The recommendations of the Committee are as follows :—

(*a*) That two areas for practical demonstration be acquired, the one in England and the other in Scotland, of not less than 2,000 acres, if possible, nor over 10,000 acres in each case. We suggest that the Alice Holt Woods in Hampshire be made available as soon as possible to serve as a demonstration area in England; and that a suitable estate be purchased in Scotland, as convenient as possible to Edinburgh, for the same purpose. These recommendations would have to be carried out by arrangement between the Commissioners of Woods and Forests and the Board of Agriculture, and assistance should be looked for from local authorities, societies, and individuals interested in forestry and technical education.

(*b*) That additional facilities for instruction be afforded, by the appointment of a lecturer on forestry in connection with each of the Universities of Cambridge and Oxford, and that example plots be provided in connection with each of these centres and with Edinburgh.

(*c*) That a good grounding in forestry form an integral part of the curriculum of the colleges providing instruction in Agriculture in Great Britain; and that short courses of instruction suitable for the requirements of young foresters be also provided there. Instructors should also be available for giving practical advice in connection with the management of woods, the owners of which desire an expert's opinion.

(*d*) That provision be made for the education of foresters and woodmen by employing students to work in both the demonstration forests, and that suitable buildings be erected on the ground for the instruction and, where necessary, for the accommodation of these student-foresters.

(*e*) That lectures be given, under the auspices of the County Councils, in neighbourhoods where there is a considerable area under wood, and that scholarships be offered in such counties to enable working foresters to attend courses of lectures.

(*f*) That the inequality shewn to exist in the levy of the estate duty on timber be redressed.

(*g*) That the Government be urged to secure the early enactment of a Bill to protect owners of woods against loss by fire caused by sparks from locomotives.

(*h*) That the inquiry conducted in 1895, concerning the area of woodlands, be repeated by the Board of Agriculture, and that details concerning the character of the timber crop grown upon them be ascertained.

(*i*) That the attention of Corporations and Municipalities be drawn to the desirability of planting with trees the catchment areas of their water supply.

Committee on Poisons: Report. [*Cd.* 1442.] *Price* 2*d.* *Minutes of Evidence, with Appendices and Index.* [*Cd.* 1443.] *Price* 1*s.* 6*d.*

The Committee recommend several alterations to Schedule A of the Pharmacy Act, 1868, and the addition of a third section to include preparations for use in connection with agriculture, horticulture, or sanitation, to be sold only by licensed persons, and subject to regulations to be made by the Privy Council. The preparations recommended by the Committee for inclusion in the proposed section are preparations containing arsenic and preparations of tobacco and its alkaloids, both exclusively for use in connection with agriculture and horticulture, and preparations of carbolic acid or its homologues for use as sheep-wash, or for any other purpose in connection with agriculture, horticulture, or sanitation. All such preparations are to be sold in closed vessels or receptacles distinctly labelled with the word "Poison," the name and address of the seller, and a notice of the agricultural, horticultural or special purpose for which the preparations are intended.

LIVE WEIGHT PRICES OF CATTLE.

The complete returns made to the Board of Agriculture under the Markets and Fairs (Weighing of Cattle) Act, 1891, are now available for the year 1902. Similar particulars have been obtained annually since the year 1893, and it may be desirable to summarise briefly the indications which the figures afford of the progress which the practice of weighing cattle has made at the scheduled markets during the ten years in which the Act has been in operation.

In the year 1893, out of 1,219,000 cattle entering the markets at the nineteen places in Great Britain then scheduled, 92,500 head, or 7½ per cent., were reported as having been weighed. In 1898, Falkirk and Carlisle were added to the list of markets, and in that year 138,650, or nearly 11 per cent., cattle were weighed out of a total of 1,264,000 exposed for sale. During the whole of the decade the number weighed, has, year by year, steadily increased, and in 1902 it was 184,500, or about 14½ per cent. of the total sent to the markets for sale. As has been pointed out on previous occasions, the practice of submitting cattle to the weighing test is much more prevalent in Scotland than in England. Even in the first year for which these returns were received, about 27 per cent. of the cattle entering the Scottish markets were reported as weighed, and in 1902 the proportion had increased to 33 per cent. In England the corresponding proportion in the past year was only 8·69 per cent., but this represented a substantial advance as compared with 1893, when no more than 2¼ per cent. of the number marketed passed over the weighbridge.

The extent to which the practice of weighing cattle has prevailed at each of the scheduled places, will be seen from the following table, which shows for triennial periods since 1893, and for 1902 separately, the average annual percentage reported as weighed to the total number exposed for sale :—

Markets.	Percentage of Number Weighed to Number Entering.			
	1893–1895.	1896–1898.	1899–1901.	1902.
England.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Ashford	1·35	1·03	1·19	1·09
Birmingham	0·08	0·04	0·07	—
Bristol	0·01	0·21	0·09	—
Carlisle	—	*12·38	14·93	15·22
Leicester	1·48	1·73	2·05	2·82
Leeds	3·48	4·30	4·32	8·62
Lincoln	0·13	0·49	0·08	—
Liverpool	6·16	10·41	14·48	16·09
London	12·47	17·41	17·83	22·64
Newcastle	1·34	2·04	2·89	2·64
Norwich	0·50	0·32	0·16	0·12
Salford	0·28	0·92	2·55	3·48
Shrewsbury	8·81	12·83	26·05	43·50
Wakefield	0·41	1·03	7·24	10·42
York	0·05	0·08	0·02	—
Scotland.				
Aberdeen	31·08	40·00	42·93	47·28
Dundee	46·68	72·79	53·42	54·52
Edinburgh	41·89	38·82	40·65	42·55
Falkirk	—	*32·35	35·75	29·66
Glasgow	2·05	10·88	18·75	19·91
Perth	20·68	20·45	15·84	20·90
England	2·73	3·99	6·49	8·69
Scotland	26·83	30·39	31·14	33·08
Total	8·00	10·34	12·20	14·16

* For the year 1898 only.

Generally speaking, it would seem that the use of the weighbridge in connection with the sale of cattle has tended to increase in favour in those markets where it has once been to any extent adopted, but it appears also that at five out of the twenty-one scheduled markets practically no use has been made during the past ten years of the weighbridges provided in accordance with the Act. The places so distinguished are Birmingham, Bristol, Lincoln, Norwich and York, while at Ashford the numbers weighed have been so insignificant that it might be added to the list of markets at which no advantage has been taken of the facilities provided.

At Leicester, Newcastle, and Salford, the proportion weighed has increased, although it still remains very small. At Leeds the number in previous years has not exceeded 5 per cent., but

in 1902 it reached 8·62 per cent. At Liverpool the advance has been more substantial, 16 per cent. being weighed in 1902 compared with an average of $6\frac{1}{4}$ per cent. in the three years 1893–95. The number weighed in 1902 at Shrewsbury was much in excess of any previous year, and in the three years 1899–1901 the proportion was 26 per cent., as against 8·81 per cent. in 1893–95. At Wakefield, also, considerable progress in the direction of a more frequent use of the weighbridge appears to have been made. Among the Scotch markets the most striking advance was apparent at Glasgow, where from 2 per cent. in 1893–95 the proportion has risen to nearly 20 per cent. in 1902. Aberdeen also shows a steady increase, but at Falkirk and Dundee the numbers have recently showed some signs of diminution.

So far as the collection of information concerning prices is concerned, in addition to the six markets named above as not making any appreciable use of the weighing machine, no sufficient particulars are obtained from the two markets of Salford and Wakefield, although 4,004 head were weighed at the former in the past year and 7,364 head at the latter. Comparative details relating to prices are, therefore, available only from the thirteen markets shown in the table below, seven of which are in England and six in Scotland. From the returns supplied by these market authorities the average live weight prices for three grades of cattle have been calculated for 1902 as in previous years. The number of animals on which the price is based is given in each case, but it will be seen that as regards third quality beasts in two instances the numbers returned are too small to afford a basis for statistical comparison.

Prime quality cattle ranged in price from 35s. 6d. per cwt. at Carlisle to 40s. 6d. per cwt. at London. In Scotland the maximum price was reported from Edinburgh, where 893 animals averaged 5s. per stone, or 40s. per cwt., but the range of price was much less than in England, the lowest average value being 38s. 4d. per cwt., which was recorded both at Falkirk and Glasgow. For second quality beasts, the highest price was realised at Edinburgh, where 12,845 animals realised 37s. 2d. per cwt., while, as was the case with prime cattle, this quality fetched a less sum at Carlisle than at any of the other markets. Among cattle classed as inferior or third quality, the lowest

level reached was at Dundee, where 2,032 head averaged 26s. 2d. per cwt., while at Aberdeen 5,727 head fetched only 6d. per cwt. more.

PLACES.	INFERIOR or Third Quality.			GOOD or Second Quality.			PRIME or First Quality.		
	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.	Number	Price per Stone.	Price per Cwt.
		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.
Carlisle ...	1,697	3 5¼	27 6	1,721	3 10½	31 0	5,922	4 5¼	35 6
Leicester ...	11	3 11	31 4	212	3 11¾	31 10	973	4 5¾	35 10
Leeds... ...	—	—	—	800	4 1¾	33 2	2,094	4 6½	36 4
Liverpool ...	908	3 6¼	28 2	2,409	4 0	32 0	8,489	4 6¼	36 2
London ...	10	3 7¾	29 2	1,387	4 6¼	36 2	4,112	5 0¾	40 6
Newcastle ...	—	—	—	405	4 3½	34 4	2,251	4 11½	39 8
Shrewsbury..	494	3 8¼	29 6	676	4 2	33 4	623	4 8	37 4
Aberdeen ...	5,727	3 4	26 8	6,499	4 5½	35 8	10,559	4 10½	39 0
Dundee ...	2,032	3 3¼	26 2	4,781	4 6	36 0	2,725	4 11½	39 8
Edinburgh...	—	—	—	12,845	4 7¾	37 2	893	5 0	40 0
Falkirk ...	838	3 11	31 4	1,278	4 4½	35 0	1,368	4 9½	38 4
Glasgow ...	1,293	4 5¼	35 6	2,230	4 7¼	36 10	8,155	4 9½	38 4
Perth	201	3 11	31 4	1,595	4 4¾	35 2	2,591	4 10½	39 0

The above particulars are of interest as indicating local differences in price, but the returns on which they are based also afford material for ascertaining a figure which may be regarded as the average value realised for the two higher grades of cattle in Great Britain as a whole. This average price has been calculated for the past five years by dividing the total recorded value by the aggregate weight of the animals for which particulars have been furnished from the thirteen markets, and is given in the following table, together with the number of animals on which the figure is based.

In 1898 it will be seen that the average price for prime animals was 33s. 8d., and for second quality 31s. 10d. per cwt.; in the following year there was a rise of 1s. 10d. and 1s. 6d. respectively, while a further increase in 1900 brought values up to 37s.

and 34s. 10d. per cwt. In 1901, there was some falling off, though prices remained on the average above those of either

Years.	Prime or First Quality.		Good or Second Quality.	
	Number.	Price per Cwt.	Number.	Price per Cwt.
		s. d.		s. d.
1898	36,898	33 8	45,854	31 10
1899	43,448	35 6	37,964	33 4
1900	43,905	37 0	36,779	34 10
1901	41,126	36 0	39,903	34 2
1902	50,755	38 0	36,838	35 10

1898 or 1899, but in the past year British fat stock experienced another advance, which raised first quality beasts to 38s., and second quality cattle to 35s. 10d. per cwt. In both cases, however, these prices were only 1s. per cwt. more than those obtained two years previously.

These annual prices afford a useful means of comparing one year with another, and, ascertained as they are from weekly records extending over the whole year, may serve to correct impressions obtained from values prevailing over short periods or in particular localities. In addition, figures ascertained monthly in a similar manner are also available, and these are shown in the following table for 1902 and the two preceding years. The course of these prices is also indicated in the diagram on page 556.

In the year 1902 prices of fat cattle exhibited considerably greater variation than those of the preceding year. As compared with those of 1900, however, although they were distinctly higher, the general trend of values during the twelve months was very similar. June, it will be seen, was the month of maximum, preceded and followed by lower values in the spring and autumn, with some recovery in December. Similar tendencies may be traced in the course of prices in 1901, although the variations were very much less pronounced.

In 1902 prices first began to rise in April, when an increase of

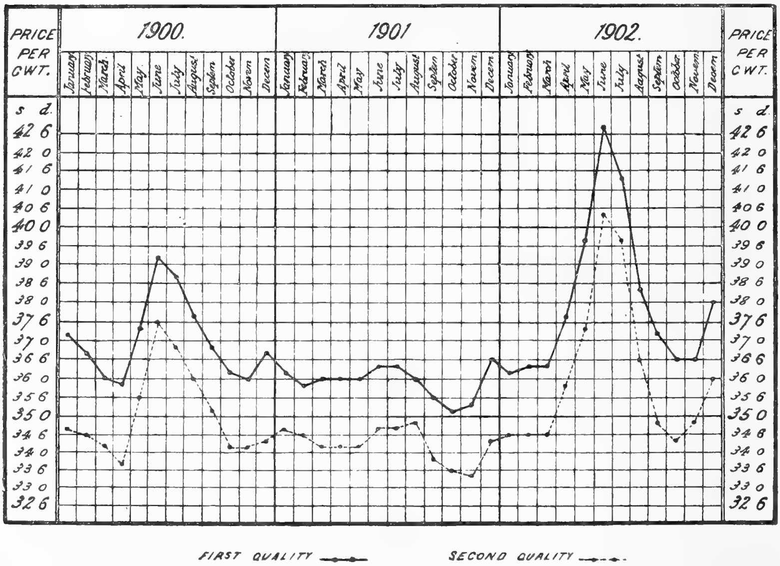
1s. 4d. per cwt. in both first and second quality was recorded ; in May a further rise of 2s. for prime and 1s. 6d. for second quality took place ; while in June the highest average monthly price of the year was reached by an increase amounting to 3s. per cwt., which brought the best beasts up to 42s. 8d. per cwt., and second

Month.	Prime or First Quality.			Good or Second Quality.		
	1902.	1901.	1900.	1902.	1901.	1900.
	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*
January	36 2	36 2	37 2	34 6	34 8	34 8
February... ...	36 4	35 10	36 8	34 6	34 6	34 6
March	36 4	36 0	36 0	34 6	34 2	34 2
April	37 8	36 0	35 10	35 10	34 2	33 8
May	39 8	36 0	37 4	37 4	34 2	35 6
June	42 8	36 4	39 2	40 4	34 8	37 6
July	41 4	36 4	38 8	39 8	34 8	36 10
August	38 4	36 0	37 8	36 6	34 10	36 0
September ...	37 2	35 6	36 10	34 10	33 10	35 2
October	36 6	35 2	36 2	34 4	33 6	34 2
November ...	36 6	35 4	36 0	34 10	33 4	34 2
December ...	38 0	36 6	36 8	36 0	34 4	34 4

quality animals to 40s. 4d. per cwt. In July a check was shewn followed by a decline which continued till November and the year closed with values rather above those of the same month in the two previous years.

The weighing of store cattle was more freely resorted to in 1902, as the number weighed for which prices were recorded was 19,464, compared with 14,054 in 1901 and 11,396 in 1900 Of this total 15,959, or about four-fifths, were weighed at Shrewsbury. The prices realised at that market were 29s. 2d. for third quality beasts, 32s. 10d. for second quality, and 36s. 6d. for first quality animals.

The number of recorded sales of fat cattle at an agreed price per cwt. or per stone live weight in 1902, was 12,172, as compared with 10,632 head in 1901, and these actual sales by weight



were reported from the nine markets of Leicester, Liverpool, London, Norwich, Wakefield, Dundee, Edinburgh, Falkirk, and Glasgow.

The usual tables, giving details for each of the scheduled places for the complete year 1902, and for the fourth quarter, are appended:—

I.—CATTLE, SHEEP, AND SWINE *entering and weighed at the Markets and Marts of the undermentioned Places in the* YEAR **1902,** *as returned under the Markets and Fairs (Weighin of Cattle) Act,* 1891 (54 *and* 55 *Vict. c.* 70).

PLACES.	Cattle.			Sheep.			Swine.		
	Total Number entering the Markets or Marts.	Number Weighed.	Number Weigh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices wer given.
ENGLAND.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Ashford ...	11,087	121	—	91,425	—	—	21,370	—	—
Birmingham ...	24,076	—	—	73,148	—	—	206,228	—	—
Bristol... ...	66,620	—	—	107,231	—	—	2	—	—
Carlisle ...	61,362	9,340	9,340	294,094	—	—	13,815	—	—
Leicester ...	67,826	1,913	1,643	80,973	80	80	7,315	120	—
Leeds	33,564	2,894	2,894	118,095	1,890	1,890	22	—	—
Lincoln ...	9,860	—	—	65,608	—	—	12,382	51	51
Liverpool ...	73,384	11,806	11,806	477,378	4,878	4,878	262	46	46
London ...	81,830	18,529	5,509	483,580	7,703	58	2,155	—	—
Newcastle-upon-Tyne ...	100,470	2,656	2,656	355,602	—	—	37,912	2,090	2,090
Norwich ...	115,387	140	133	169,782	—	—	21,176	7	6
Salford ...	115,061	4,004	—	584,980	—	—	2,654	—	—
Shrewsbury ...	66,605	28,975	17,752	80,181	—	—	31,811	—	—
Wakefield ...	70,667	7,364	1,060	183,123	36	—	8,632	115	99
York	112,316	—	—	175,356	—	—	5,582	—	—
SCOTLAND.									
Aberdeen ...	50,405	23,834	23,834	217,419	23,700	23,700	14,317	—	—
Dundee ...	17,589	9,589	9,579	27,234	2,698	2,698	3,017	—	—
Edinburgh ...	74,589	31,736	*15,694	256,898	136	20	8,772	—	—
Falkirk ...	11,747	3,484	3,484	11,590	—	—	113	—	—
Glasgow ...	76,487	15,226	11,682	373,348	594	254	4,949	—	—
Perth... ...	61,669	12,888	*4,387	281,000	1,117	1,117	11,865	293	293
TOTAL for ENGLAND ...	1,010,115	87,742	52,793	3,340,556	14,587	6,906	371,318	2.429	2,292
TOTAL for SCOTLAND ...	292,486	96,757	*68,660	1,167,489	28,245	27,789	43,033	293	293
Total ...	1,302,601	184,499	*121,453	4,508,045	42,832	34,695	414,351	2,722	2,585

* Prices for 16,042 cattle in addition to the above were quoted from Edinburgh and for 8,501 cattle from Perth, but without distinguishing the quality.

II.—CATTLE, SHEEP, AND SWINE, *entering and weighed at the Markets and Marts of the undermentioned Places in the* FOURTH QUARTER *of* **1902**, *as returned under the Markets and Fairs (Weighing of Cattle) Act*, 1891 (54 *and* 55 *Vict. c.* 70).

PLACES.	Cattle.			Sheep.			Swine.		
	Total Number entering the Markets or Marts.	Number Weighed.	Number Weigh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.
ENGLAND.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Ashford ...	3,735	13	—	22,872	—	—	6,700	—	—
Birmingham ...	5,197	—	—	12,426	—	—	64,698	—	—
Bristol	21,007	—	—	16,366	—	—	—	—	—
Carlisle ...	22,349	2,376	2,376	83,643	—	—	4,103	—	—
Leicester ...	18,949	732	665	25,250	33	33	2,277	87	—
Leeds	8,320	992	992	22,570	—	—	—	—	—
Lincoln ...	2,433	—	—	14,030	—	—	2,918	—	—
Liverpool ...	26,745	5,061	5,061	96,740	1,459	1,459	89	25	25
London ...	26,930	6,617	1,208	92,090	1,404	—	925	—	—
Newcastle-upon-Tyne ...	27,602	390	390	4,744	—	—	13,907	590	590
Norwich ...	42,928	—	—	23.638	—	—	5,905	—	—
Salford ...	32,166	1,101	—	101,371	—	—	623	—	—
Shrewsbury ...	19,862	10,208	6,659	19,203	—	—	7,902	—	—
Wakefield ...	19,540	2,435	131	39,668	36	—	1,510	115	99
York	38,408	—	—	91,015	—	—	1,621	—	—
SCOTLAND.									
Aberdeen ...	14,660	6,362	6,362	36,226	6,692	6,692	3,535	—	—
Dundee ...	3,984	2,104	2,104	5,860	427	427	837	—	—
Edinburgh ...	22,026	9,590	*5,114	62,390	36	—	2,428	—	—
Falkirk ...	3,308	945	945	3,302	—	—	48	—	—
Glasgow ...	19,428	3,612	2,699	105,761	120	—	1,239	—	—
Perth	14,368	2,094	*813	77,325	279	279	3,384	76	76
TOTAL for ENGLAND ...	316,171	29,925	17,482	745,626	2,932	1,492	113,178	817	714
TOTAL for SCOTLAND ...	77,774	24,707	*18,037	290,864	7,554	7,398	11,471	76	76
Total ...	393,945	54,632	*35,519	1,036,490	10,486	8,890	124,649	893	790

* Prices for 4,476 cattle in addition to the above were quoted from Edinburgh and for 1,281 cattle from Perth, but without distinguishing the quality.

III.—CATTLE, SHEEP, AND SWINE, *entering, weighed, and priced at the Scheduled Places in Great Britain, in the* FOURTH QUARTERS *of* **1902** and **1901**.

Animals.	4th Quarter, 1902.	4th Quarter, 1901.
CATTLE:	No.	No.
Entering markets	393,945	364,606
Weighed	54,632	47,912
Prices returned	41,276	38,159
Prices returned with quality distinguished ...	35,519	32,887
SHEEP:		
Entering markets	1,036,490	961,501
Weighed	10,486	6,743
Prices returned with quality distinguished ...	8,890	5,782
SWINE:		
Entering markets	124,649	114,934
Weighed	893	402
Prices returned with quality distinguished ...	790	402

IV.—*Prices of* FAT CATTLE *in the* FOURTH QUARTER *of* **1902**.

PLACES.	INFERIOR or Third Quality.			GOOD or Second Quality.			PRIME or First Quality.		
	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.
		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.
Carlisle ...	369	3 4¾	27 2	491	3 10½	31 0	1,516	4 6½	36 4
Leicester ...	—	—	—	89	3 8¾	29 10	364	4 4¼	34 10
Leeds ...	—	—	—	308	4 1¼	32 10	684	4 4½	35 0
Liverpool ...	241	3 5¾	27 10	1,261	3 11¾	31 10	3,559	4 4¼	34 10
London ...	—	—	—	517	4 4¾	35 2	691	4 10¾	39 2
Newcastle ...	—	—	—	134	4 1½	33 0	256	4 9½	38 4
Shrewsbury	130	3 7¼	28 10	116	4 1	32 8	66	4 5¼	35 6
Aberdeen ...	1,303	3 3½	26 4	1,712	4 6½	36 4	2,484	4 11¾	39 10
Dundee ...	455	3 0½	24 4	1,017	4 5¾	35 10	604	4 10¾	39 2
Edinburgh ...	—	—	—	3,647	4 5¾	35 10	298	4 11½	39 8
Falkirk ...	274	3 9	30 0	379	4 3¼	34 2	292	4 8¾	37 10
Glasgow ...	411	4 3¼	34 2	572	4 5	35 4	1,716	4 7¾	37 2
Perth ...	49	3 11	31 4	383	4 4½	35 0	381	4 9	38 0

PRICES OF MEAT, CORN, AND DAIRY PRODUCE.

AVERAGE PRICES of DEAD MEAT, per 8 lbs., at the LONDON CENTRAL MEAT MARKET, during the Fourth Quarter of 1902, and during the Months of December, 1902, and January and February, 1903.

(*Compiled from the prices quoted weekly in the "Meat Trades' Journal."*)

DESCRIPTION.	4TH QUARTER. 1902.	DECEMBER. 1902.	JANUARY. 1903.	FEBRUARY. 1903.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
BEEF :—				
Scotch, short sides	4 8 to 5 0	4 6 to 4 10	4 6 to 4 9	4 2 to 4 6
,, long sides	4 2 ,, 4 5	4 1 ,, 4 4	4 1 ,, 4 4	3 11 ,, 4 2
English...	3 9 ,, 4 1	3 9 ,, 4 1	3 10 ,, 4 1	3 8 ,, 3 11
Cows and Bulls	2 2 ,, 3 4	2 1 ,, 3 5	2 4 ,, 3 6	2 2 ,, 3 5
American, Birkenhead killed...	3 7 ,, 3 11	3 7 ,, 3 11	3 9 ,, 4 0	3 7 ,, 3 9
,, Deptford killed ...	3 8 ,, 4 1	3 7 ,, 4 1	3 10 ,, 4 1	3 8 ,, 3 11
Canadian Ranchers	3 1 ,, 3 5	3 1 ,, 3 6	—	—
American, Refrig. hind-quarters	4 3 ,, 4 7	4 0 ,, 4 4	3 7 ,, 4 0	3 6 ,, 3 10
,, ,, fore-quarters	2 11 ,, 3 1	2 9 ,, 3 0	2 7 ,, 2 10	2 6 ,, 2 8
Australian, Frozen, hind-quarters	2 10 ,, —	2 10 ,, —	2 7 ,, —	2 3 ,, 2 4
,, ,, fore-quarters	2 5 ,, 2 6	2 5 ,, —	2 2 ,, —	1 9 ,, —
New Zealand, ,, hind-quarters	3 3 ,, —	3 3 ,, —	3 0 ,, —	2 7 ,, 2 8
,, ,, fore-quarters	2 8 ,, 2 9	2 7 ,, 2 8	2 5 ,, —	2 0 ,, —
River Plate, ,, hind-quarters	3 0 ,, —	3 0 ,, —	2 10 ,, —	2 6 ,, —
,, ,, fore-quarters	2 8 ,, —	2 8 ,, —	2 3 ,, —	2 0 ,, —
MUTTON :—				
Scotch	4 5 ,, 4 10	4 6 ,, 4 11	4 11 ,, 5 5	5 1 ,, 5 5
English	4 1 ,, 4 7	4 3 ,, 4 9	4 8 ,, 5 2	4 9 ,, 5 3
Ewes	3 1 ,, 3 6	3 4 ,, 3 9	3 8 ,, 4 3	3 9 ,, 4 4
Continental	3 10 ,, 4 3	4 1 ,, 4 6	4 7 ,, 4 11	—
New Zealand, Frozen... ...	3 0 ,, 3 4	3 4 ,, 3 6	3 2 ,, 3 6	2 7 ,, 3 4
Australian, Frozen	3 0 ,, —	3 1 ,, —	—	—
River Plate, Frozen	2 11 ,, —	3 1 ,, —	2 11 ,, —	2 7 ,, —
LAMB :—				
English	4 0 ,, 4 8	—	—	—
New Zealand, Frozen... ...	3 8 ,, 3 10	3 8 ,, 3 9	4 0 ,, 4 2	4 5 ,, 4 7
VEAL :—				
Best	4 6 ,, 4 11	4 7 ,, 5 1	4 9 ,, 5 2	4 10 ,, 5 5
Secondary and middling ...	3 8 ,, 4 3	3 10 ,, 4 5	4 1 ,, 4 8	3 10 ,, 4 8
PORK :—				
English, best	4 6 ,, 4 10	4 4 ,, 4 8	3 11 ,, 4 3	3 11 ,, 4 3
,, seconds and thirds ...	3 7 ,, 3 11	3 7 ,, 3 11	3 5 ,, 3 9	3 4 ,, 3 9

AVERAGE PRICES OF DEAD MEAT, per 8 lb., at the LONDON CENTRAL MEAT MARKET, during the Years 1898 to 1902 inclusive.

(Compiled from the prices quoted weekly in the "Meat Trades' Journal.")

DESCRIPTION.	1898.	1899.	1900.	1901.	1902.
BEEF :—	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Scotch, short sides ...	3 11 to 4 3	4 3 to 4 6	4 5 to 4 8	4 2 to 4 5	4 8 to 5 0
" long sides ...	3 8 " 3 10	3 11 " 4 1	4 0 " 4 3	3 11 " 4 1	4 3 " 4 6
English	3 6 " 3 8	3 9 " 3 11	3 10 " 4 0	3 9 " 3 11	4 1 " 4 4
Cows and Bulls	2 0 " 2 8	2 0 " 2 10	2 1 " 3 2	2 1 " 3 2	2 2 " 3 5
American, Birkenh'd kill'd	3 1 " 3 5	3 5 " 3 8	3 8 " 3 10	3 6 " 3 9	3 11 " 4 1
" Deptford killed	3 2 " 3 5	3 6 " 3 9	3 8 " 3 11	3 7 " 3 10	4 0 " 4 3
American Refrig. hind-qrs	3 6 " 3 9	3 7 " 3 10	3 10 " 4 0	3 8 " 3 10	4 4 " 4 7
" " fore-qrs	2 2 " 2 5	2 4 " 2 6	2 8 " 2 10	2 4 " 2 7	2 11 " 3 2
Australian, Froz'n hind-qrs	1 11 " 2 1	2 1 " 2 4	2 5 " 2 7	2 3 " 2 4	2 8 " 2 9
" " fore-qrs	1 6 " 1 8	1 8 " 1 9	2 1 " 2 2	1 9 " —	2 2 " 2 3
New Zealand, " hind-qrs	2 2 " 2 4	2 3 " 2 6	2 7 " 9	2 6 " 2 7	3 3 " 3 4
" " " fore-qrs	1 8 " 1 10	1 9 " 1 11	2 2 " 2 3	1 10 " 1 11	2 7 " —
MUTTON :—					
Scotch	4 1 " 4 8	4 5 " 4 11	4 9 " 5 2	4 6 " 4 10	4 6 " 4 11
English	3 10 " 4 5	4 2 " 4 8	4 6 " 4 11	4 2 " 4 8	4 3 " 4 8
Ewes	2 9 " 3 3	3 1 " 3 6	3 4 " 3 9	3 3 " 3 8	3 2 " 3 8
Continental	3 7 " 3 11	3 9 " 4 2	4 1 " 4 6	3 11 " 4 4	4 0 " 4 4
New Zealand, Frozen ...	1 9 " 2 6	1 11 " 2 8	2 4 " 2 9	2 1 " 2 10	2 4 " 2 10
Australian, Frozen ...	1 8 " 1 10	1 10 " 2 0	2 3 " 2 4	1 11 " 2 1	2 3 " 2 4
River Plate, Frozen ...	1 8 " 1 9	1 11 " 2 0	2 3 " 2 5	2 1 " 2 2	2 5 " 2 6
LAMB :—					
English	4 10 " 5 9	5 0 " 6 2	5 6 " 6 4	5 6 " 6 5	5 2 " 6 2
New Zealand, Frozen ...	3 1 " 3 5	2 11 " 3 3	3 1 " 3 5	3 3 " 3 8	3 4 " 3 7
VEAL :—					
Best	4 2 " 4 7	4 4 " 4 9	4 4 " 4 9	4 6 " 4 10	4 6 " 4 11
Seconds and Middling ...	3 7 " 4 0	3 8 " 4 2	3 10 " 4 3	3 7 " 4 4	3 9 " 4 4
PORK :—					
Best	3 11 " 4 3	3 6 " 3 11	3 10 " 4 2	4 3 " 4 8	4 4 " 4 8
Seconds and Thirds ...	3 5 " 3 10	3 0 " 3 5	3 4 " 3 9	3 7 " 4 0	3 7 " 4 0

AVERAGE WHOLESALE PRICES of CATTLE and SHEEP, per 8 lb., sinking the offal, at the METROPOLITAN CATTLE MARKET, during each Quarter of 1902, with the Mean Prices for the year.

PERIOD.	CATTLE.			SHEEP.		
	Inferior.	Second.	First.	Inferior.	Second.	First.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
1st Quarter, 1902	2	3 11	4 8	3 6	4 10	5 6
2nd Quarter, ,,	3	4 6	5 1	3 10	5 2	6 0
3rd Quarter, ,,	3 1	7	5 1	3 8	5 0	5 9
4th Quarter, ,,	2 9	4 4	5 1	3 6	5 0	5 11
Year - - -	2 11	4 4	5 0	3 7	5 0	5 9

AVERAGE WHOLESALE PRICES of BEEF and MUTTON, per 8 lb., by the Carcase, at LIVERPOOL and GLASGOW, during each Quarter of 1902, with the Mean Prices for the year.

PERIOD.	LIVERPOOL.*		GLASGOW.†	
	BEEF.	MUTTON.	BEEF.	MUTTON.
	s. d. s. d.	*s. d. s. d.*	*s. d. s. d.*	*s. d. s. d.*
1st Quarter, 1902	2 6 to 4 0	3 4 to 5 4	4 4 to 4 10	5 0 to 5 10
2nd Quarter, ,,	3 4 ,, 4 8	3 6 ,, 5 6	4 4 ,, 5 8	4 4 ,, 6 8
3rd Quarter, ,,	2 8 ,, 4 8	3 4 ,, 5 0	4 2 ,, 5 6	4 0 ,, 5 8
4th Quarter, ,,	2 8 ,, 4 4	3 4 ,, 5 2	3 8 ,, 5 0	4 4 ,, 5 8
Year - - -	2 9 ,, 4 5	3 4 ,, 5 3	4 1 ,, 5 3	4 5 ,, 5 11

* Compiled from information furnished by the Medical Officer of Health, Liverpool. The prices quoted are for Carcases of Animals *slaughtered at the Liverpool Abattoir*, and do not apply to Imported Meat.

† Compiled from information furnished by the Principal of the Veterinary College, Glasgow.

BERLIN MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Dead Weight) in the BERLIN CATTLE MARKET in the under-mentioned Months of 1902 and 1903, together with the Mean Prices for the Year 1902.

MONTHS.	OXEN.		SHEEP.		SWINE.	
	Per Cwt.		Per Cwt.		Per Cwt.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
November, 1902... ...	64	9	69	0	59	9
December ,, ...	65	2	66	5	58	3
Mean of the Year 1902...	61	9	61	6	60	6
January, 1903	65	2	67	0	57	3

NOTE.—The above prices are compiled from the Wholesale Prices quoted in the *Monatliche Nachweise über den auswärtigen Handel des deutschen Zollgebiets.* The prices for swine are live weight prices with 20 per cent. tare.

PARIS MARKET.

AVERAGE PRICES of CATTLE, SHEEP, and SWINE (Medium Quality, Dead Weight), per cwt., in the PARIS CATTLE MARKET in the under-mentioned Months of 1902 and 1903, together with the Mean Prices for the Year 1902.

MONTHS.	OXEN.		CALVES.		SHEEP.		PIGS.	
	Per Cwt.		Per Cwt.		Per Cwt.		Per Cwt.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
December, 1902... ...	53	4	65	2	72	11	53	9
Mean of the year 1902...	51	3	66	3	72	1	58	0
January, 1903	54	6	74	4	76	4	54	8
February ,, ...	53	5	74	10	77	11	57	2

NOTE.—The above prices have been compiled from the weekly returns published in the *Journal d'Agriculture Pratique.*

CHICAGO.

AVERAGE PRICES of CATTLE at CHICAGO per cwt. (Live Weight) in the under-mentioned Months of 1902 and 1903, with the Mean Prices for the Year 1902.

MONTH.	Medium to Good Steers.					Good to Choice Steers.					Choice to Extra Prime Steers.				
	s.	*d.*		*s.*	*d.*	*s.*	*d.*		*s.*	*d.*	*s.*	*d.*		*s.*	*d.*
December, 1902...	23	4	to	25	11	27	8	to	31	6	32	1	to	34	1
Mean of the year 1902 ...	27	1	,,	31	2	29	8	,,	34	7	35	2	,,	37	3
January, 1903 ...	22	1	,,	24	7	26	4	,,	28	10	28	10	,,	31	7
February, ,, ...	21	3	,,	23	0	23	0	,,	25	2	25	2	,,	28	4

Compiled from the Live Stock Reports issued by Messrs. Clay, Robinson and Co., of the Union Stock Yards, Chicago, Illinois.

AVERAGE VALUES, per cwt., of various Kinds of DEAD MEAT Imported into the United Kingdom from FOREIGN COUNTRIES and BRITISH POSSESSIONS in each Quarter of 1902, with the Average Values for the year.

(*Computed from the Trade and Navigation Accounts.*)

PERIOD.	BEEF.				MUTTON.		PORK.				BACON.		HAMS.	
	Fresh.		Salted.		Fresh.		Fresh.		Salted.					
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
1st Quarter, 1902 ...	40	3	28	8	35	1	43	3	31	6	47	8	48	3
2nd Quarter, ,, ...	43	6	31	4	38	1	44	11	28	10	51	3	50	0
3rd Quarter, ,, ...	43	10	33	2	38	5	44	2	28	4	55	8	54	9
4th Quarter, ,, ...	42	11	34	6	39	7	44	9	31	0	56	10	55	8
Year	42	8	31	9	37	9	44	2	29	9	52	9	52	1

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels,* computed from the Weekly Averages of Corn Returns from the Returning Markets of ENGLAND AND WALES, pursuant to the Corn Returns Act, 1882, together with the QUANTITIES returned as sold at such Markets, in the under-noted periods of the Years 1902, 1901, and 1900.

QUARTER ENDED	PRICES. 1902.	PRICES. 1901.	PRICES. 1900.	QUANTITIES. 1902.	QUANTITIES. 1901.	QUANTITIES. 1900.
Wheat.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	27 3	26 3	25 11	826,066	744,018	868,378
Midsummer ...	29 10	27 1	25 9	444,639	547,737	854,497
Michaelmas ...	30 2	26 11	28 7	222,495	535,109	511,347
Christmas ...	25 0	26 7	27 4	754,737	778,686	689,261
Barley.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	26 8	25 3	25 1	669,251	844,616	888,949
Midsummer ...	25 6	24 9	24 3	40,875	53,408	93,157
Michaelmas ...	25 1	24 0	24 5	32,318	236,164	143,552
Christmas ...	25 5	26 8	25 11	2,040,980	2,235.441	2,065,135
Oats.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	20 3	17 6	16 7	239,048	236,316	246,949
Midsummer ...	22 1	19 3	18 2	88,274	81,172	110,163
Michaelmas ...	21 3	18 7	18 7	101,130	131,023	116,880
Christmas ...	17 0	18 4	17 0	402.833	265,703	237,791

* Section 8 of the Corn Returns Act, 1882, provides that where returns of purchases of British Corn are made to the local inspector of Corn Returns in any other measure than the imperial bushel or by weight or by a weighed measure, that officer shall convert such returns into the imperial bushel, and in the case of weight or weighed measure the conversion is to be made at the rate of 60 imperial pounds for every bushel of wheat, 50 imperial pounds for every bushel of barley, and 39 imperial pounds for every bushel of oats.

CORN PRICES :—ANNUAL AVERAGES.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Weekly Averages of Corn Returns from the Returning Markets, together with the QUANTITIES returned as sold at such Markets during each of the years 1896 to 1902.

YEARS.	PRICES. Wheat.	PRICES. Barley.	PRICES. Oats.	QUANTITIES. Wheat.	QUANTITIES. Barley.	QUANTITIES. Oats.
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
1896 ...	26 2	22 11	14 9	2,111,021	3,391,862	655,153
1897 ...	30 2	23 6	16 11	2,756,561	3,257,187	550,434
1898 ...	34 0	27 2	18 5	2,602,416	3,653,657	688,064
1899 ...	25 8	25 7	17 0	3,530,961	3,296,744	776,361
1900 ...	26 11	24 11	17 7	2,923,483	3,190,793	711,784
1901 ...	26 9	25 2	18 5	2,605,550	3,369,629	714,215
1902 ...	28 1	25 8	20 2	2,247,937	2,783,424	831,285

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1903, and in the corresponding Weeks in 1902 and 1901.

Weeks ended (*in* 1903).	Wheat.			Barley.			Oats.		
	1903.	1902.	1901.	1903.	1902.	1901.	1903.	1902.	1901.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 3 ...	25 0	27 7	26 5	23 11	26 7	25 4	16 10	19 10	17 2
,, 10 ...	24 11	27 8	26 7	24 1	26 7	25 6	17 0	20 0	17 3
,, 17 ...	24 11	27 8	26 11	24 1	26 11	25 9	16 10	20 0	17 3
,, 24 ...	25 0	27 7	26 10	24 1	26 7	25 6	16 11	20 3	17 6
,, 31 ...	25 4	27 4	26 7	24 3	26 7	25 7	17 0	20 2	17 8
Feb. 7 ...	25 6	27 2	26 8	23 9	26 9	25 7	16 11	20 3	17 7
,, 14 ...	25 6	26 11	26 4	23 7	27 5	25 4	17 1	20 3	17 7
,, 21 ...	25 4	27 1	26 1	23 4	26 11	25 0	17 1	20 4	17 7
,, 28 ...	25 3	27 1	25 11	23 2	26 8	25 0	17 1	20 5	17 9
Mar. 7 ...	25 3	27 0	25 9	23 1	26 8	25 4	17 1	20 5	17 7
,, 14 ...	25 1	27 1	25 9	22 10	26 6	25 1	17 0	20 6	17 7
,, 21 ...	25 1	27 1	25 8	22 9	26 4	24 11	16 10	20 6	17 9
,, 28 ...		27 2	26 0		27 2	24 9		20 7	18 0
Apl. 4 ...		27 3	26 3		26 5	25 3		20 6	18 0
,, 11 ...		27 5	26 5		26 7	26 0		21 0	18 1
,, 18 ...		27 7	26 8		27 1	25 7		21 1	18 8
,, 25 ...		28 9	26 8		26 5	25 8		21 6	18 8
May 2 ...		29 9	26 9		27 5	26 4		21 10	19 1
,, 9 ...		30 9	27 3		26 10	26 2		22 6	19 1
,, 16 ...		31 1	27 7		25 3	24 2		22 5	19 4
,, 23 ...		31 6	27 7		25 4	24 1		22 6	19 8
,, 30 ...		31 6	27 7		25 1	23 8		22 10	19 9
June 6 ...		31 3	27 6		24 3	22 9		22 11	20 1
,, 13 ...		30 11	27 8		23 8	24 0		22 8	19 7
,, 20 ...		30 6	27 6		23 5	23 2		23 0	20 3
,, 27 ...		30 5	27 6		24 3	25 4		22 9	20 0
July 4 ...		30 8	27 8		25 5	21 9		22 5	19 10
,, 11 ...		30 10	27 2		24 8	23 10		22 10	19 9
,, 18 ...		30 11	27 3		23 8	23 4		22 10	19 11
,, 25 ...		31 5	27 3		25 0	22 1		22 8	19 4
Aug. 1 ...		31 8	27 6		25 0	23 1		22 10	20 0
,, 8 ...		31 7	27 7		24 11	22 1		22 11	19 4
,, 15 ...		31 7	27 4		24 9	27 2		22 2	18 9
,, 22 ...		31 5	27 3		22 10	23 7		21 11	18 1
,, 29 ...		31 7	27 0		26 2	24 3		21 0	17 10
Sept. 5 ...		29 9	26 5		24 6	25 1		19 10	17 6
,, 12 ...		27 10	26 2		27 5	24 11		19 2	17 4
,, 19 ...		27 1	26 0		26 4	25 5		18 4	17 4
,, 26 ...		26 6	25 10		26 4	25 10		18 0	17 2
Oct. 3 ...		25 10	25 8		25 11	26 3		17 5	17 7
,, 10 ...		25 5	25 9		26 2	26 5		17 2	17 6
,, 17 ...		25 1	25 10		26 1	26 8		17 0	17 8
,, 24 ...		24 11	25 11		26 4	26 10		17 0	17 5
,, 31 ...		25 0	26 2		26 7	26 10		17 3	17 7
Nov. 7 ...		25 1	26 6		26 3	27 0		17 2	17 8
,, 14 ...		25 0	26 9		25 11	26 9		17 3	18 3
,, 21 ...		24 11	27 1		25 6	26 10		17 2	18 7
,, 28 ...		25 0	27 1		24 11	26 9		17 0	18 9
Dec. 5 ...		25 1	27 1		24 4	26 7		17 0	19 0
,, 12 ...		25 0	27 2		24 3	26 8		16 10	19 3
,, 19 ...		24 10	27 7		24 2	26 8		16 10	19 8
,, 26 ...		24 10	27 7		24 1	26 8		16 8	19 10

AVERAGE VALUE per IMPERIAL QUARTER OF WHEAT IMPORTED into the UNITED KINGDOM from the under-mentioned Foreign Countries and British Possessions in the years 1900, 1901, and 1902.

Countries from which Exported.	Average Value per Imperial Quarter. 1900.	1901.	1902.
	s. d.	s. d.	s. d.
Argentine Republic	28 2	28 4	29 1
Chile	29 9	—	29 0
Germany	28 1	29 11	28 3
Roumania	29 9	26 7	27 6
Russia	29 3	28 2	28 2
Turkey	27 10	25 1	25 11
U.S. of America, Atlantic ...	29 9	28 6	28 5
U.S. of America, Pacific	29 1	28 7	29 4
India, British	29 11	26 7	28 6
North America, British	29 10	28 4	28 9
Australia	30 3	29 0	30 5
New Zealand	28 7	27 10	31 11

AVERAGE PRICES of WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER in FRANCE, and ENGLAND and WALES in the under-mentioned Months of 1902 and 1903.

MONTH.	FRANCE.	ENGLAND.
WHEAT.		
	Per Qr. s. d.	Per Qr. s. d.
December, 1902	36 2	24 11
January, 1903	36 7	25 0
February ,, ...	38 1	25 4
BARLEY.		
	Per Qr. s. d.	Per Qr. s. d.
December, 1902	22 11	24 2
January, 1903	23 0	24 1
February ,, ...	23 3	23 5
OATS.		
	Per Qr. s. d.	Per Qr. s. d.
December, 1902	19 0	16 10
January, 1903	19 1	16 11
February ,, ...	19 3	17 0

Note.—The prices of French grain have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique.* The prices of British grain are official averages based on the weekly returns furnished under the Corn Returns Act, 1882.

AVERAGE PRICES of WHEAT, BARLEY, and OATS, per IMPERIAL QUARTER in BELGIUM in the under-mentioned Months of 1902 and 1903, with Mean Prices for the Year 1902.

Month.	Wheat.		Barley.		Oats.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
November, 1902	27	4	22	6	18	6
December ,, ...	27	1	21	11	17	11
Mean of the year 1902	28	6	23	0	20	11
January, 1903	27	3	22	6	17	9

The above prices have been compiled from the official monthly averages published in the *Moniteur Belge.*

AVERAGE PRICES of WHEAT, BARLEY, and OATS per IMPERIAL QUARTER at LONDON, PARIS, and BERLIN, in the under-mentioned Months of 1902 and 1903, with the Mean Prices for the Year 1902.

Month.	London.		Paris.		Berlin.	
			WHEAT.			
	Per Qr.		Per Qr.		Per Qr.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
November, 1902	25	10	36	9	33	4
December ,, ...	26	1	35	11	34	4
Mean of the year 1902	28	11	37	6	35	7
January, 1903	26	0	37	2	31	2*
February ,, ...	26	2	39	7	—	
			BARLEY.			
	Per Qr.		Per Qr.		Per Qr.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
November, 1902	26	0	23	0	24	2*
December ,, ...	23	6	23	6	24	2*
Mean of the year 1902	26	5	23	6	23	2*
January, 1903	22	11	23	7	24	2*
February ,, ...	21	11	23	10	—	
			OATS.			
	Per Qr.		Per Qr.		Per Qr.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
November, 1902	18	2	19	2	19	3
December ,, ...	17	10	18	11	19	10
Mean of the year 1902	20	6	22	6	21	4
January, 1903	17	10	18	9	17	10*
February ,, ...	17	7	19	2	—	

Note.—The London quotations represent the price of British corn as returned under the Corn Returns Act, 1882; the prices of grain in Paris have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the quotations for Berlin are the average prices published monthly in the *Monatliche Nachweise über den auswärtigen Handel des deutschen Zollgebiets.*

* Prices at Breslau; no quotations for Berlin.

AVERAGE WHOLESALE PRICES of BUTTER, MARGARINE, and CHEESE in the under-mentioned Months of 1902 and 1903.

(*Compiled from the "Grocer."*)

DESCRIPTION.	DECEMBER, 1902. Per Cwt.*				JANUARY, 1903. Per Cwt.*				FEBRUARY, 1903. Per Cwt.*			
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
BUTTER:												
Cork, 1sts	102	0	—		109	0	—		107	6	—	
,, 2nds	93	9	—		96	0	—		96	6	—	
,, 3rds	88	0	—		87	0	—		84	0	—	
,, 4ths	81	0	—		81	0	—		77	9	—	
Irish Creameries ...	100	0 to	111	6	102	9 to	111	3	102	0 to	109	0
,, Factories ...	94	0 ,,	100	0	94	0 ,,	100	0	92	0 ,,	98	0
Dutch, Friesland ...	107	3 ,,	111	3			—				—	
,, Creameries ...	108	0 ,,	111	6	105	6 ,,	110	0	107	6 ,,	112	0
,, Rolls, boxes ...	12	6 ,,	13	0	12	6 ,,	13	0	12	6 ,,	13	0
French, extra mild ...	110	0 ,,	114	0	105	3 ,,	110	6	106	9 ,,	112	9
,, best ordinary ...	102	0 ,,	107	6	96	9 ,,	101	3	99	0 ,,	105	0
,, 2nds and inferior ...	84	6 ,,	97	6	80	9 ,,	94	9	76	6 ,,	97	0
,, Fresh, Paris baskets	110	0 ,,	112	3	107	6 ,,	111	0	109	9 ,,	112	9
,, Rolls, per doz. ...	10	10 ,,	14	4	10	7 ,,	14	3	10	3 ,,	14	4
Italian Rolls, per doz.	11	6 ,,	13	4	11	0 ,,	13	0	11	0 ,,	13	0
Danish and Swedish ...	115	3 ,,	118	3	107	6 ,,	111	3	109	0 ,,	111	9
Russian and Siberian ...	83	6 ,,	99	6	84	0 ,,	98	0	83	0 ,,	97	0
Argentine	108	6 ,,	111	6	105	6 ,,	108	9	98	0 ,,	101	6
Colonial, fine	110	6 ,,	113	0	102	9 ,,	106	9	96	0 ,,	100	6
,, good and inferior	94	0 ,,	105	0	85	3 ,,	96	9	80	6 ,,	91	6
Canadian Creameries ...	95	6 ,,	107	0	93	6 ,,	103	3	89	0 ,,	99	0
,, Dairies	83	6 ,,	91	6	83	6 ,,	90	0	82	0 ,,	87	0
MARGARINE	42	0 ,,	66	0	40	9 ,,	64	9	36	6 ,,	56	6
CHEESE, ENGLISH:												
Cheddar, ...	57	6 ,,	74	0	58	9 ,,	74	6	64	6 ,,	76	0
,, loaf	66	0 ,,	68	0	66	9 ,,	69	3	69	6 ,,	73	0
Wiltshire ,, ...	73	6 ,,	75	6	74	0 ,,	76	0	74	0 ,,	76	0
Double Gloucester ...	67	6 ,,	69	6	68	0 ,,	70	0	69	0 ,,	70	0

* Except where otherwise stated.

WEEKLY PRICES (WHOLESALE) of VEGETABLES and FRUIT at COVENT GARDEN MARKET in each week of February, 1903.

(Compiled from the "Gardeners' Chronicle.")

Description.	Week ending											
	February 5th.			February 12th.			February 19th.			February 26th.		
VEGETABLES—	s. d.		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.		s. d.
Artichokes, Globe, per dozen	3 0	to	—	3 0	to	—	2 6	to	—	2 6	to	—
,, Jerusalem, sieve	1 0	,,	1 6	1 0	,,	1 6	1 0	,,	1 3	0 9	,,	1 0
Asparagus, Eng., bndl.	5 0	,,	6 0	5 0	,,	6 0	5 0	,,	6 6	6 6	,,	7 0
Beans, dwarf, per lb.	3 0		—	3 0		—	2 0	,,	2 3	2 0		—
Beetroots, per bushel	1 0	,,	1 3	1 0	,,	1 3	1 0	,,	1 3	1 0	,,	1 3
Brussels Sprouts, sieve	0 9	,,	1 0	0 9	,,	1 0	0 6	,,	1 0	0 6	,,	1 0
Cabbages, per tally	1 6	,,	2 0	1 6	,,	2 0	1 6		—	1 0	,,	1 6
Carrots, doz. bunches	1 6	,,	2 6	1 6	,,	2 6	1 6	,,	2 0	1 6	,,	2 0
,, washed, bags	2 0	,,	2 6	2 0	,,	2 6	1 6	,,	2 0	1 6	,,	2 0
Cauliflowers, per doz.	1 3	,,	2 0	1 3	,,	2 0	1 0	,,	2 0	1 0	,,	2 0
Celery, per doz. bndls.	6 0	,,	12 0	6 0	,,	12 0	6 0	,,	10 0	6 0	,,	10 0
Cress, per doz. punnets	1 3		—	1 3		—	1 3		—	1		—
Cucumbers, per doz.	8 0	,,	11 0	8 0	,,	11 0	8 0	,,	12 0	9 0	,,	14 0
Endive, per doz.	2 0		—	2 0		—	2 0		—	2 0		—
Garlic, per lb.	0 3		—	0 3		—	0 6		—	0 6		—
Horseradish, foreign, per bunch	1 3	,,	1 8	1 3	,,	1 8	1 3	,,	1 6	1 3	,,	1 6
Leeks, per doz. bnchs.	1 6		—	1 6		—	1 0		—	1 0	,,	1 6
Lettuces cabbage, doz.	1 4	,,	1 9	0 10	,,	1 0	0 10	,,	1 0	0 10	,,	1 0
Mint, per doz. bundles	4 0	,,	8 0	4 0	,,	8 0	3 0	,,	6 0	3 0	,,	6 0
Mushrooms, House, lb.	0 10		—	0 6	,,	0 9	0 6	,,	0 10	0 6	,,	0 9
Onions, per bag	3 0	,,	4 6	3 0	,,	4 6	2 6	,,	3 6	2 6	,,	3 6
,, Eng., per cwt.	5 0		—	5 0		—	4 0	,,	4 6	4 0	,,	4 6
,, picklers, sieve	2 6	,,	3 0	2 6	,,	3 0	2 6	,,	3 0	2 6	,,	3 0
Parsley, doz. bunches	2 0	,,	2 6	2 0	,,	2 6	1 6	,,	2 0	1 6	,,	2 0
,, per sieve	0 9	,,	1 0	0 9	,,	1 0	0 9	,,	1 0	0 9	,,	1 0
Parsnips, per bag	1 6	,,	2 0	1 6	,,	2 0	1 6	,,	2 0	1 6	,,	2 0
Potatoes, per ton	75 0	,,	115 0	75 0	,,	90 0	75 0	,,	110 0	70 0	,,	110 0
,, new Teneriffe, per cwt.	11 0	,,	12 0	11 0	,,	12 0	11 0	,,	14 0	10 0	,,	14 0
,, Kidney, French, per lb	0 1½		—	0 1½		—	0 1½		—	—		—
Rhubarb, York, doz.	0 10	,,	1 0	0 10	,,	1 0	0 10	,,	1 0	0 9	,,	1 0
Salad, small, punnets, per doz.	1 3		—	1 3		—	1 3		—	1 3		—
Savoys, tally	3 0	,,	4 6	3 0	,,	4 6	2 6	,,	4 0	2 0	,,	4 0
Seakale, punnets, doz.	12 0		—	10 0	,,	12 0	10 0	,,	12 0	10 0	,,	12 0
Turnips, per doz.	1 6	,,	2 6	1 6	,,	2 6	1 6	,,	2 6	1 6	,,	2 6
,, per bags	1 0	,,	2 0	1 0	,,	2 0	1 0	,,	2 0	1 0	,,	2 0
Watercress, doz. bnchs.	0 6		—	0 6		—	0 6		—	0 6		—
FRUIT—												
Apples, Eng., per sieve	2 0	,,	3 6	2 0	,,	3 6	2 0	,,	3 6	2 0	,,	3 6
,, dessert, various, per bushel	4 0	,,	6 0	4 0	,,	6 0	4 0	,,	6 0	4 0	,,	6 0
,, cookers, bushel	4 0	,,	8 0	4 0	,,	8 0	2 6	,,	8 0	3 6	,,	8 0
,, American, barrel	16 0	,,	20 0	16 0	,,	18 0	15 0	,,	18 0	18 0	,,	24 0
Cobnuts, per lb.	0 2½	,,	0 3	0 3½	,,	0 4	0 3		—	0 3		—
Grapes, Gros Colmar A, per lb.	1 9	,,	2 0	2 0	,,	2 6	2 0	,,	3 0	2 0	,,	3 6
,, B, per lb.	1 4	,,	1 6	1 3	,,	1 9	1 6	,,	2 9	1 6	,,	2 9
,, Alicante, lb.	0 10	,,	1 6	1 6	,,	2 0	1 6	,,	3 0	1 6	,,	3 0
,, Muscats, A, per lb.	4 0	,,	6 0	4 0	,,	6 0	—		—	—		—
,, B, per lb.	2 0	,,	3 0	2 0	,,	3 0	—		—	—		—
Pears, stewing, crate	8 6	,,	14 0	8 6	,,	14 0	12 0		—	—		—

DISEASES OF ANIMALS IN GREAT BRITAIN.

NUMBER of OUTBREAKS of **Foot-and-Mouth Disease** and of **Swine-Fever,** with the Number of SWINE Slaughtered by order of the Board of Agriculture, in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Foot-and-Mouth Disease.		Swine-Fever.	
	OUTBREAKS Confirmed.	ANIMALS Attacked.	OUTBREAKS Confirmed.	SWINE Slaughtered as Diseased or as having been exposed to infection.
	No.	*No.*	*No.*	*No.*
June, 1901	2	17	1,490	7,066
September, 1901 ...	—	—	680	3,391
December, 1901 ...	—	—	345	1,615
March, 1902... ...	1	30	399	2,122
June, 1902	—	90	469	1,976
September, 1902 ...	—	—	455	2,161
December, 1902 ...	—	—	365	2,004

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax** and **Glanders** in GREAT BRITAIN in each of the under-mentioned periods.

QUARTER ENDED	Anthrax.		Glanders (including Farcy).	
	OUTBREAKS Reported.	ANIMALS Attacked.	OUTBREAKS Reported.	ANIMALS Attacked.
	No.	*No.*	*No.*	*No.*
June, 1901	193	281	327	551
September, 1901 ...	114	165	398	677
December, 1901 ...	181	302	300	571
March, 1902	202	357	285	543
June, 1902	175	268	278	489
September, 1902 ...	143	205	321	544
December, 1902 ...	158	202	271	464

NUMBER of CASES of **Rabies** in DOGS in GREAT BRITAIN in each of the under-mentioned periods.

THREE MONTHS ENDED.	NUMBER OF CASES.
30th June, 1901	—
30th September, 1901	—
31st December, 1901	—
31st March, 1902	8
30th June, 1902	4
30th September, 1902	—
31st December, 1902	1

DISEASES OF ANIMALS IN IRELAND.

NUMBER of OUTBREAKS of **Pleuro-Pneumonia** and of **Swine-Fever**, with the Number of CATTLE and SWINE Slaughtered by order of the Department of Agriculture and Technical Instruction in IRELAND, in each of the under-mentioned periods.

QUARTER ENDED	Pleuro-Pneumonia.			Swine-Fever.	
	OUT-BREAKS Con-firmed.	CATTLE found Diseased.	CATTLE Slaughtered as having been exposed to Infection.	OUT-BREAKS Con-firmed.	SWINE Slaughtered as Diseased, or as having been exposed to Infection.
	No.	*No.*	*No.*	*No.*	*No.*
June, 1901	—	—	—	67	1,242
September, 1901 ...	—	—	—	72	1,089
December, 1901 ...	—	—	—	24	436
March, 1902	—	—	—	38	644
June, 1902	—	—	—	51	1,168
September, 1902 ...	—	—	—	58	1,109
December, 1902 ...	—	—	—	19	241

NUMBER of OUTBREAKS reported as having taken place, and Number of ANIMALS returned as having been ATTACKED by **Anthrax, Glanders**, and **Rabies** in IRELAND in each of the under-mentioned periods.

QUARTER ENDED	Anthrax.		Glanders (including Farcy).		Rabies. Cases Reported.	
	OUT-BREAKS Reported.	ANIMALS Attacked.	OUT-BREAKS Reported.	ANIMALS Attacked.	DOGS.	OTHER ANIMALS.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
June, 1901 ...	1	2	3	3	—	1
September, 1901.	—	—	—	—	—	—
December, 1901.	1	2	1	2	—	—
March, 1902 ...	—	—	4	13	—	—
June, 1902 ...	—	—	2	8	—	—
September, 1902.	—	—	2	14	—	—
December, 1902.	—	—	2	8	—	—

PRICES OF WOOL.

AVERAGE PRICES of ENGLISH WOOL, per pack of 240 lb., in the under-mentioned Months of 1902 and 1903.

(*Compiled from the "Economist."*)

DESCRIPTION.	December, 1902.	January, 1903.	February, 1903.
	£ s. d. £ s. d.	£ s. d. £ s. d.	£ s. d. £ s. d.
South Down ...	8 10 0 to 11 10 0	8 10 0 to 11 10 0	8 10 0 to 11 10 0
Half-breds ...	6 0 0 ,, 7 10 0	6 13 0 ,, 7 16 0	6 15 0 ,, 8 0 0
Leicester ...	5 10 0 ,, 6 0 0	6 3 0 ,, 6 14 0	6 5 0 ,, 7 0 0
Kent Fleeces ...	6 0 0 ,, 6 5 0	6 8 0 ,, 6 16 0	6 10 0 ,, 7 0 0

ORDNANCE SURVEY MAPS.

The Ordnance Survey are issuing a new series of folding pocket maps for England and Wales on the scale of one inch to the mile. The maps are printed in colours on sheets 18 by 12 inches, mounted on canvas, in a cover or flat, price 1s. each. The one-inch map can also be procured at the same price in black and white, showing outline and contours; or in outline, with hills printed either in black or brown: the outline map has recently been revised. These maps are not only useful for general topographical purposes, but should also prove serviceable to cyclists and pedestrians, since they show all roads, indicating their character and whether metalled or not, footpaths, hills, rivers, towns, villages, railway stations, and local boundaries.

Combined one-inch outline maps have also been published for a number of districts.

These combined maps are based on the revised one-inch map. In most cases they are being published folded in covers, and with the principal roads coloured, at prices varying from 1s. to 1s. 6d.

Cheap maps of counties, groups of counties, or districts are also being published on the $\frac{1}{4}$-inch scale, with main roads coloured, at 6d. plain, or 9d. if folded in a cover.

There are agents for the sale of Ordnance Survey Maps in most of the chief towns, and maps can be ordered and indexes, &c., seen at many Head Post Offices, in places where there are no agents. They can also be ordered, through any bookseller,

from the Director-General, Ordnance Survey, Southampton; or, in the case of Ireland, from the Officer in Charge, Ordnance Survey, Dublin.

Small scale pocket maps of the districts round the following towns are supplied to the public at the Head Post Offices in these towns on application without any charge beyond the price of the map, viz.:—Scarborough, Rochdale, Burton-on-Trent, Southport, West Hartlepool, South Shields, Luton, Worthing, Bury St. Edmunds, Huntingdon, Stafford, Macclesfield, Crewe, Stockport, Ilkley, Richmond (Yorkshire), Driffield, Sittingbourne, Cromer, Llandudno, Weymouth, Littlehampton, Greenock, Blairgowrie, and Pitlochry.

A leaflet describing the various editions of the Ordnance Survey Maps may be obtained, post free and free of charge, from the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W.

Geological Survey Publications of Great Britain and Ireland.

The Agents for the sale of Ordnance Survey Maps are also agents for the sale of Geological Survey Publications.

THE "BOARD OF TRADE JOURNAL."

The "Board of Trade Journal," now published weekly at the cost of one penny, is the principal medium through which intelligence collected by the Commercial Intelligence Branch of the Board of Trade and intended for general information is conveyed to the public. It contains notices of contracts for tender and other openings for trade abroad; particulars of changes affecting British trade in foreign and colonial customs tariffs; special articles on the trade and industries of foreign countries and British possessions; items of interest under such sectional headings as "Proposed Tariff Change," "Shipping and Transport" (containing port charges and changes, new steam-ship-lines, trade and rates, &c.); "Minerals, Metals and Machinery," &c., and other information likely to be useful to manufacturers and traders. Various statistical tables and reviews of recent Government publications are also included in the contents.

The "Board of Trade Journal" is issued every Thursday morning and single copies may be obtained direct from the publishers, Messrs. Eyre & Spottiswoode, East Harding Street, Fleet Street, E.C., at a cost of 1d., or it may be subscribed for (post free) at the rate of 6s. 6d. per annum for the United Kingdom.

POST OFFICE SAVINGS BANKS, WITH GOVERNMENT SECURITY.

ADVANTAGES TO DEPOSITORS.

SECURITY.—The Post Office Savings Banks are established by Act of Parliament, and every depositor has the *direct security* of the State for the repayment of his deposits.

DEPOSITS.—Any sum from a shilling upwards, excluding pence, may be deposited at one time, and any number of deposits may be made in the course of a year (ending 31st December) up to a limit of £50. A person may have £200, in all on his deposit account, including interest.

WITHDRAWALS can be made with the utmost promptitude by sending notice by post to the London Chief Office on the form provided for the purpose, which is obtainable at any Post Office Savings Bank, and payment can be received at any Post Office Savings Bank in the United Kingdom convenient to the depositor without regard to the office of deposit. During any year ending 31st December a depositor may replace the amount of any one withdrawal previously made in the same year.

INTEREST at the rate of £2 10s. per cent. per annum is allowed on every complete pound deposited, so long as the sum to a depositor's credit does not exceed £200. Whenever the balance exceeds that sum, interest will be allowed on £200, and the excess will be invested for the depositor in Government Stock, unless the depositor should otherwise direct.

TRANSFER FROM A TRUSTEE SAVINGS BANK.—If a depositor in a Trustee Savings Bank wishes to place his money in a Post Office Savings Bank, he should apply to the trustees of the Savings Bank for a Certificate of Transfer (in the form prescribed by the 10th section of the Act 24 Vict., c. 14), and should pay the certificate into any Post Office Bank as if it were a cheque. By adopting this course the depositor will avoid trouble and the risk of carrying cash from one bank to the other.

DEPOSITOR'S BOOK CAN BE USED AT ANY POST OFFICE SAVINGS BANK. A depositor may add to his deposits, or withdraw the whole or any part of them, at any Post Office Savings Bank in the United Kingdom, without change of deposit book.

NOMINATIONS.—A depositor at the age of sixteen years, or upwards, may, subject to certain limits, nominate any person to receive his Savings Bank deposits at death. A form for the purpose may be obtained, free of cost, from the Controller of the Savings Bank Department.

SECRECY.—The strictest secrecy is observed with respect to the names and addresses of depositors in Post Office Savings Banks, and the amounts deposited or withdrawn by them.

POSTAGE FREE.—No charge for postage is made to a depositor, if in the United Kingdom, for any letter passing between him and the Chief Office on Post Office Savings Bank business.

LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE.

(a.) Leaflets dealing with Insects and Fungi.

No.	Title.	No.	Title.
1	The Black Currant Mite.	35	The Celery Fly.
2	Vine and Raspberry Weevils.	38	The Carrot Fly.
3	The Turnip Fly or Flea.	41	The Red Spider or Spinning Mite.
4	Caterpillars on Fruit Trees.	46	The Stem Eelworm.
5	The Mangel Wurzel Fly.	47	The Asparagus Beetle.
10	Wireworms.	48	Pea and Bean Thrips, or Black Fly.
11	The Daddy Longlegs.		
12	The Gooseberry Saw-fly.	49	The Fruit Tree Beetle.
14	The Raspberry Moth.	52	Gooseberry Blight.
15	The Apple Blossom Weevil	53	The Pear Midge.
16	The Apple Sucker.	56	The Canker Fungus.
19	Pea and Bean Weevils.	60	The Wood Leopard Moth.
20	The Magpie Moth.	62	Pear and Cherry Saw-fly.
21	The Warble Fly.	64	White Root Rot.
22	The Diamond-back Moth.	65	The Small Ermine Moths.
23	Potato Disease.	68	Currant Aphides.
24	The Ribbon Footed Corn-fly.	69	Tent Caterpillars.
25	Chafer-beetles or White-Grubs.	70	Winter Washing of Fruit Trees.
30	The Codlin Moth.	71	The Colorado Beetle (*Out of print.*)
31	The Onion Fly.	75	Root-knot Eelworm in Cucumbers and Tomatoes.
33	Surface Caterpillars.		
34	The Woolly Aphis or Apple Root Louse.	76	Cucumber and Melon Leaf Blotch.
		77	Finger-and-Toe in Turnips.

(b.) Leaflets dealing with Birds useful to Agriculture.

40	The Kestrel or Wind-hover.	45	The Starling.
42	The Short-Eared Owl.	50	Water Wagtails or "Dishwashers."
43	Titmice.	51	The White or Barn Owl.
44	The Common Lapwing, Plover, or Peewit.	54	The Spotted Flycatcher
		55	The Swallow.

(c.) Leaflets dealing with Diseases of Animals.

28	Anthrax.	37	Rabies. (*Out of print.*)
29	Swine Fever.	61	Sheep Scab.

(d.) Leaflets relating to Acts of Parliament.

8	Farmers and Assessments to Local Rates.	27	Remission of Tithe Rentcharge.
		39	Assessment to Land Tax.
17	Preservation of Commons. (*Out of print.*)	59	Improvement of Land Act, 1899. (*Out of print.*)
18	Fertilisers and Feeding Stuffs Act.	66	Workmen's Compensation Act, 1900.
26	Farmers and the Income Tax.		

(e.) Leaflets dealing with Miscellaneous Subjects.

6	Voles and their Enemies.	63	Destruction of Charlock.
7	Autumn Catch Crops and Fodder Supply. (*Out of print.*)	67	Favus in Poultry.
		72	Purchase of Artificial Manures.
9	Ensilage.	73	Cultivation of Maize for Fodder.
13	Acorn Poisoning.	74	Purchase of Feeding Stuffs.
32	Foul Brood or Bee Pest.	78	Liver Disease of Poultry.
36	Cultivation of Osiers.	79	Rations for Farm Stock.
57	External Parasites of Poultry.	80	The Use of Artificial Manures.
58	Internal Parasites of Poultry.	81	A Substitute for Dishorning.

Copies of these Leaflets may be obtained free of charge and post free on application to the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

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